

HYSTEROETHYLACIUM WARD AND MAGATH, 1917, AND ICHTHYASCARIS WU,
1949, ASCARIDOID NEMATODES FROM AUSTRALIAN DEMERSAL FISHES

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Genera and species of ascaridoid nematodes are recorded from Australian demersal marine fishes. *Ichthyascaris* Wu is redefined with two new species and the following new combinations: *I. fisheri* (Hooper), *I. vicentei* (Santos), *I. hujani* (Olsen), *I. mediterraneus* (Lèbre and Petter), *I. chirocentri* (Yamaguti) and *I. biwakoensis* (Fujita). *Ichthyascaris* lacks flanged lips, any trace of interlabia and intestinal caecum; the excretory system is posteriorly unilateral and filamentar. Descriptions are given for the following species: *Hysterothylacium leptaspi* n. sp., *Hysterothylacium chrysostomi* n. sp., *H. sebae* n. sp., *H. tasmaniense* (Johnston and Mawson), *H. thalassini* n. sp., *H. zenis* (Baylis), *Ichthyascaris gymnocraniae* n. sp. and *I. sillagoideus* n. sp. Notes are given on an unidentified species of *Goezia* from *Arius thalassinus*. □ *Nematoda*, *Ascaridoidea*, *taxonomy*, *fish parasites*, *Indo-West Pacific*.

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A brief review of ascaridoid nematodes from Australian marine fishes was given by Bruce and Cannon (1989) recording ascaridoids from Australian pelagic marine fishes. This present work records ascaridoids from demersal and euryhaline fishes. The species treated here include only those species that were represented by adult specimens in good or reasonable condition. Material examined prior to preparation of this work included species of *Hysterothylacium* and *Ichthyascaris* from a further 10 host species. Clearly the number of species presently recorded from Australia is but a fraction of the potential total.

MATERIAL AND METHODS

The following demersal fish (or fish stomachs) were examined and, except for those reported in the species description, proved negative for adult ascaridoids. The number in parentheses is the total number of specimens examined. Fish totals of less than 4 are not represented individually.

From the Rockhampton coast and central section Great Barrier Reef, 7 species in total. Serranidae: *Plectropoma leopardus* (13); Lutjanidae: *Lutjanus malabaricus* (10) and *L. sebae* (10).

From Heron Island and Wistari Reefs, Capricorn Group, southern Great Barrier Reef, 22 species. Serranidae, 7 species including *Plectropoma leopardus* (16), *Epinephilus fasciatus* (6) and *E. merra* (5); Lutjanidae, 3 species

including *Lutjanus carponotatus* (9); Lethrinidae, *Lethrinus chrysostomus* (30), *L. nebulosus* (4) and *Gymnocranius bitorquatus* (34); Labridae, *Choerodon venustus* (26) and *C. albigena* (6).

From southeastern Queensland (Moreton Bay region) *Platycephalus fuscus* (28), *Sillago maculata* (60), *Pomatomus saltator* (34) and *Acanthopagrus australis* (20).

Names are from Grant (1987) and Hutchins and Swainston (1986).

Materials and methods are the same as used and detailed by Bruce and Cannon (1989). Measurements are given in micrometres except where otherwise indicated. Measurements in millimetres were made under binocular microscope, those in micrometres under a compound microscope.

Abbreviations used in the text: AHC - Australian Helminth Collection, at the South Australian Museum; BL - Body length; BM(NH) - British Museum (Natural History), London; CSIRO - Commonwealth Scientific and Industrial Research Organisation; ED - Ejaculatory duct; QM - Queensland Museum; SAM - South Australian Museum, Adelaide.

Goezia Zeder

The genus *Goezia* has been rediagnosed by Sprent (1978a) and more recently by Deardorff and Overstreet (1980). In both diagnoses the lack of interlabia is a character, among others, of

generic significance. To date no species of this genus that has been illustrated has shown any trace of interlabia or semi-interlabia (see 'Remarks' for *Raphidascaroides* for discussion of interlabial structures). The lack of interlabia is clearly illustrated by the SEM's of Sprent (1978a) and Lèbre and Petter (1983).

It is of some interest, therefore, to record a species of *Goezia* (or an undescribed genus closely allied to *Goezia*) from *Arius thalassinus* trawled by CSIRO in the Gulf of Carpentaria at Weipa. These samples include one that has a large mature male (31.7 mm long by 1.5 mm wide) and 2 large females (the largest measuring 50.0 mm long by 2.7 mm wide). These specimens (QM G10286) are in very poor condition and cannot be used for description. The remaining

two samples (QM GL10250, GL10285) contain immature specimens (10.7-18.0 mm). All have distinct pseudo- or sessile interlabia (Fig. 1). Additionally the serrations (or cuticular spine rows) fade away completely towards the tail in 2 specimens, and are very weak in the caudal region of the third. These are large worms compared to others of the genus, which measure as adults from under 3 mm to about 25 mm.

Hysterothylacium Ward and Magath

Bruce and Cannon (1989) described those species of the genus to be found in Australian pelagic and oceanic fishes. A further 5 species are recorded here, all from demersal or estuarine hosts. The diagnosis given by Deardorff and

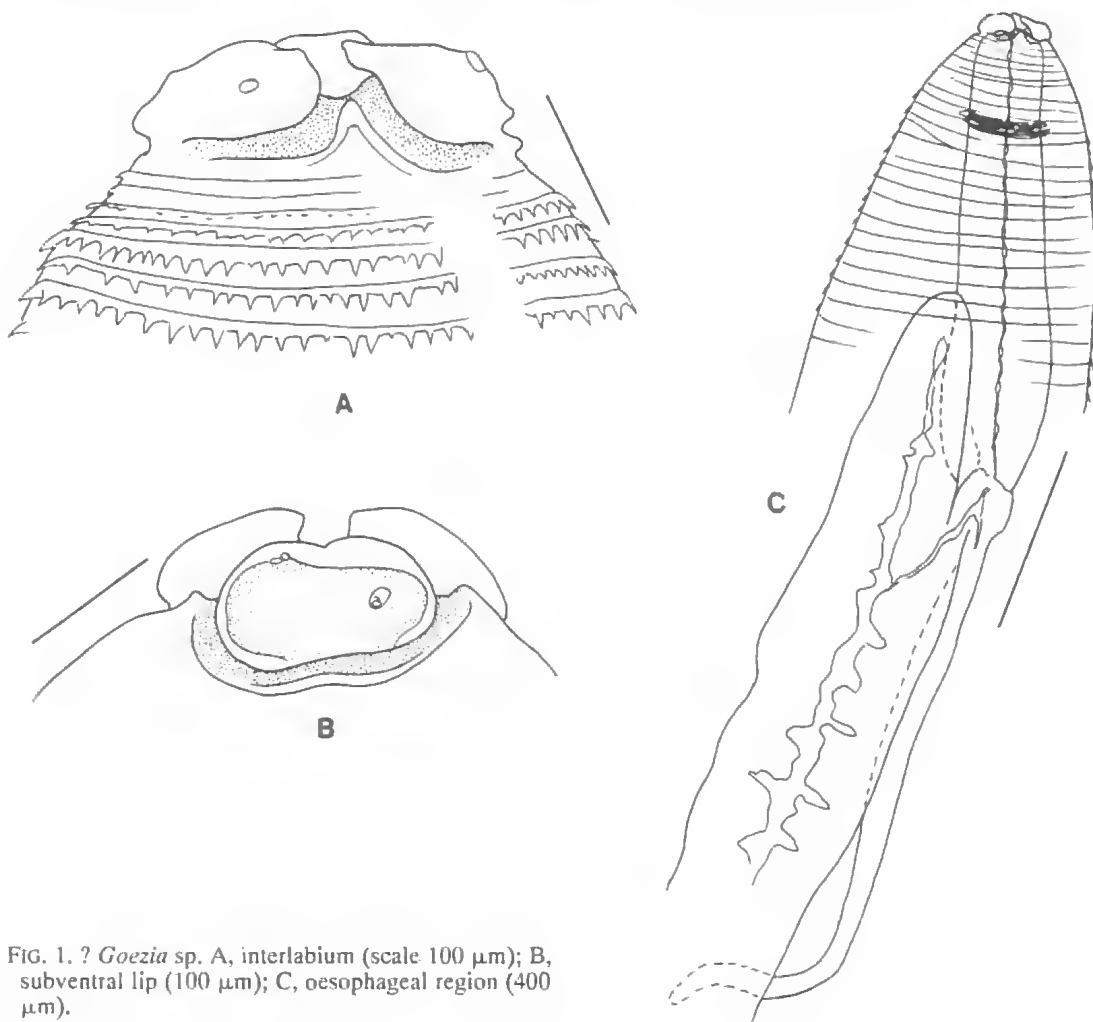


FIG. 1. ? *Goezia* sp. A, interlabium (scale 100 μ m); B, subventral lip (100 μ m); C, oesophageal region (400 μ m).

Overstreet (1981) is not in need of modification at present. *Hysterothylacium* is the largest of the ascaridoid genera, and considerable variation is present with regard to tail morphology, the excretory system, and presence or absence of alae. It is still necessary that further species be described and that a detailed description of the type species be available before a critical analysis of the genus can be given.

***Hysterothylacium leptaspi* n. sp.**
(Figs 2-4)

MATERIAL EXAMINED

All from Embley Estuary, Weipa, Gulf of Carpentaria, Q., from stomachs of *Arius leptaspi*, coll. CSIRO, 10 males, 11 females, Heinemann's Creek, middle reaches of Embley Estuary, 20 Feb. 1987 (male HOLOTYPE QM GL10244, PARATYPES QM GL10245). 18 males, 7 females, same data as above (QM GL10246, QM GL10247, AHC 18813).

Also examined: 2 females, lower reaches of estuary, 15 and 23 Feb. 1987, *Arius thalassinus*, coll. CSIRO (QM GL10248, GL 10249).

TYPE LOCALITY

Embley Estuary, Weipa, Q., ca 12°13.5'S, 144°57.0'E.

TYPE HOST

Arius leptaspi (Bleeker), Ariidae.

DIAGNOSIS

Cuticle finely annulated, appearing smooth under light microscopy; posteriorly with transverse folds. Lips with length to width ratio 1: 0.93-1.45 (mean = 1.02, $n = 15$) with deep postlabial grooves; constricted about one third length from anterior. Alae absent. Caudal papillae pairs: precloacal 40-58 in an irregular row; paracloacal 2 pairs; postcloacal 4-5 pairs, usually without doubled papillae; medioventral precloacal organ present. Spicules approximately equal in length, 1:1.03-1.10, 3.64-5.74% BL. Tail short, with finely nodulose conical lip.

DESCRIPTION

Based on 6 mature males and 8 mature females.

General. Body reaching greatest width about mid-body. Dorsal lip slightly smaller than subventrals, about as long as wide; flanges positioned about half way along lip, small and triangular, lateral constriction weakly developed. Interlabia prominent, extending

anterior to oesophagus; about half-length of lip, medially expanded. Oesophagus 7.63-10.59% BL. Ventriculus usually narrower than widest level of oesophagus, longer than wide; posteriorly narrowing gradually to ventricular appendix. Ventricular appendix very slender, (difficult to observe without dissection) 104.3-261.0% length of oesophagus. Cervical papillae conspicuous, near nerve ring. Nerve ring lying between anterior 15.0-18.3% of oesophagus. Excretory system H-shaped, anteriorly and posteriorly bilateral, with excretory nucleus about half way between nerve ring and ventriculus; excretory pore immediately posterior to nerve ring.

Male. Body 27.5-54.2 mm long, 517-1109 maximum width; width at oesophageo-intestinal junction 414-790; ratio of greatest width to length 1: 45.9-60.7 (mean = 50.51). Dorsal lip 174-202 long, 179-188 wide (2 specimens); subventral lips 221-244 long, 216-273 wide (3 specimens). Nerve ring 498-846 from anterior. Excretory pore 611-893 from anterior (3 specimens). Oesophagus 2914-4418 long by 150-244 wide. Ventriculus 141-259 long by 89-165 wide; ventricular appendix 3948-10058 long by 47-108 wide. Intestinal caecum 1692-2914 long by 169-188 wide; 58.1-75.6% (mean = 65.7%) oesophageal length (3 specimens). Ejaculatory duct 1880-2350 long, 3.6-5.0% BL. Spicules 1222-2820 long, 112.1-150.0% ED (3 specimens). Caudal papillae pairs 49-66, changing from button to mamillate at about 6th anterior to cloaca. Post cloacal pad absent. Tail 118-188 long, ventrally flexed.

Female. Body 48.3-66.8 mm long, 1034-1410 maximum width; width at oesophageo-intestinal junction 470-931; ratio of greatest width to length 1: 45.0-54.7 (mean = 41.22). Dorsal lip 221-230 long by 216-273 wide (3 specimens); subventral lips 226-244 long by 212-282 wide. Nerve ring 658-846 from anterior. Excretory pore 952-912 from anterior. Oesophagus 3666-5640 long by 216-310 wide. Ventriculus 188-376 long by 197-329 wide (3 specimens); ventricular appendix 5734-8930 long by 113-179 wide (3 specimens). Intestinal caecum 1974-3666 long by 235-282 wide; 51.9-65.0% (mean = 57.5) oesophageal length. Vulva opening 21.7- 30.0 mm or 32.4-48.0% BL from anterior; vulva area not swollen. Vagina 5.60-8.84 mm (3 specimens); uterus undivided for 5.84-10.0 mm, divided for further 6.18-7.10 mm. Tail 335-536 long.

Variation. Several minor variations were

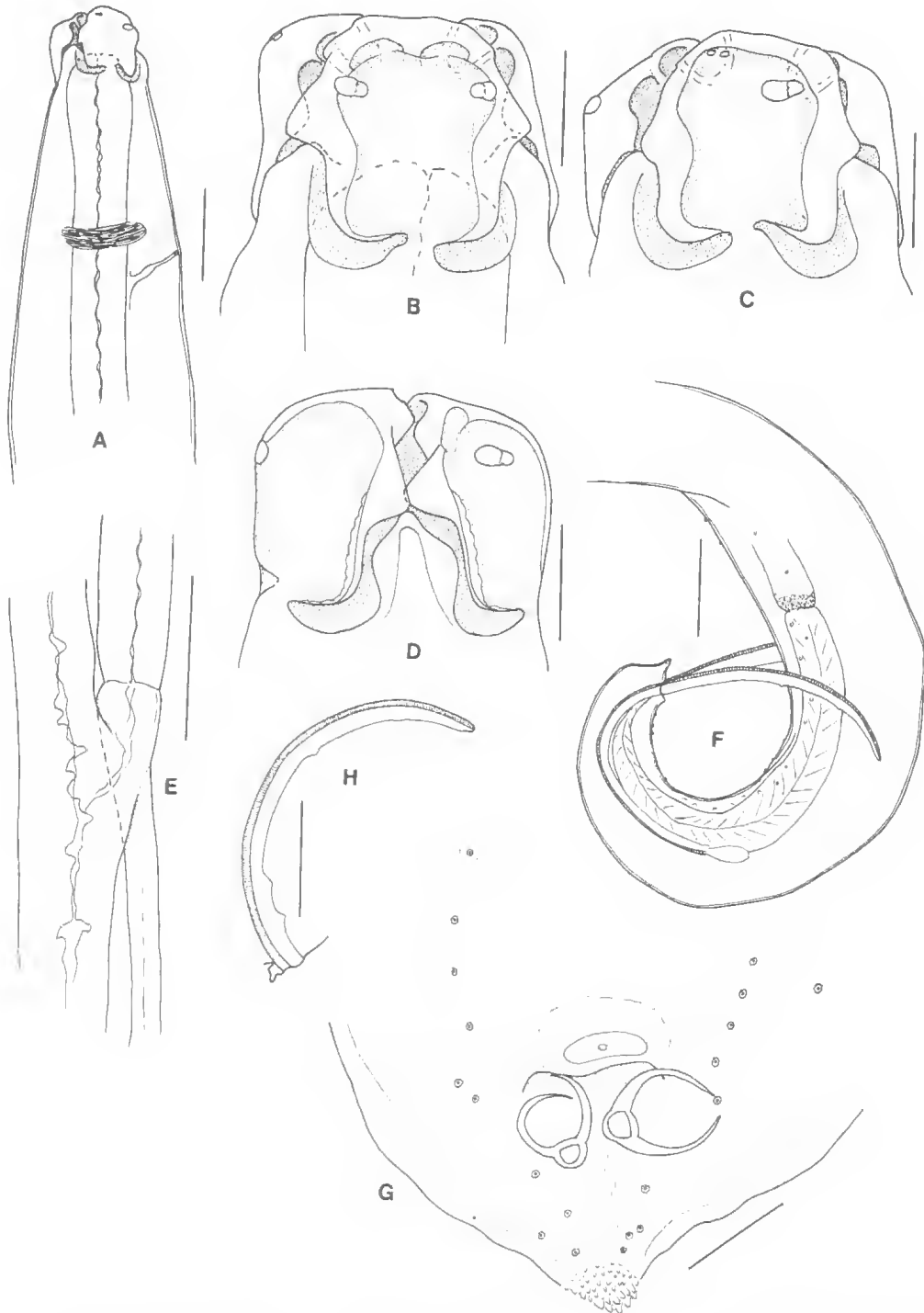


FIG. 2. *Hysterothylacium leptaspi* n. sp. All figs. ♂ #3 except where indicated. A, anterior end (scale 200 μ m); B, dorsal lip (100 μ m); C, subventral lip (100 μ m); D, subventral interlabium (100 μ m); E, ventriculus and ventricular appendix (0.50 mm); F, caudal area, ♂ #8 (0.5 mm); G, tail, ventral view, ♂ #3 (100 μ m); H, emergent spicule, ♂ #1 (200 μ m).

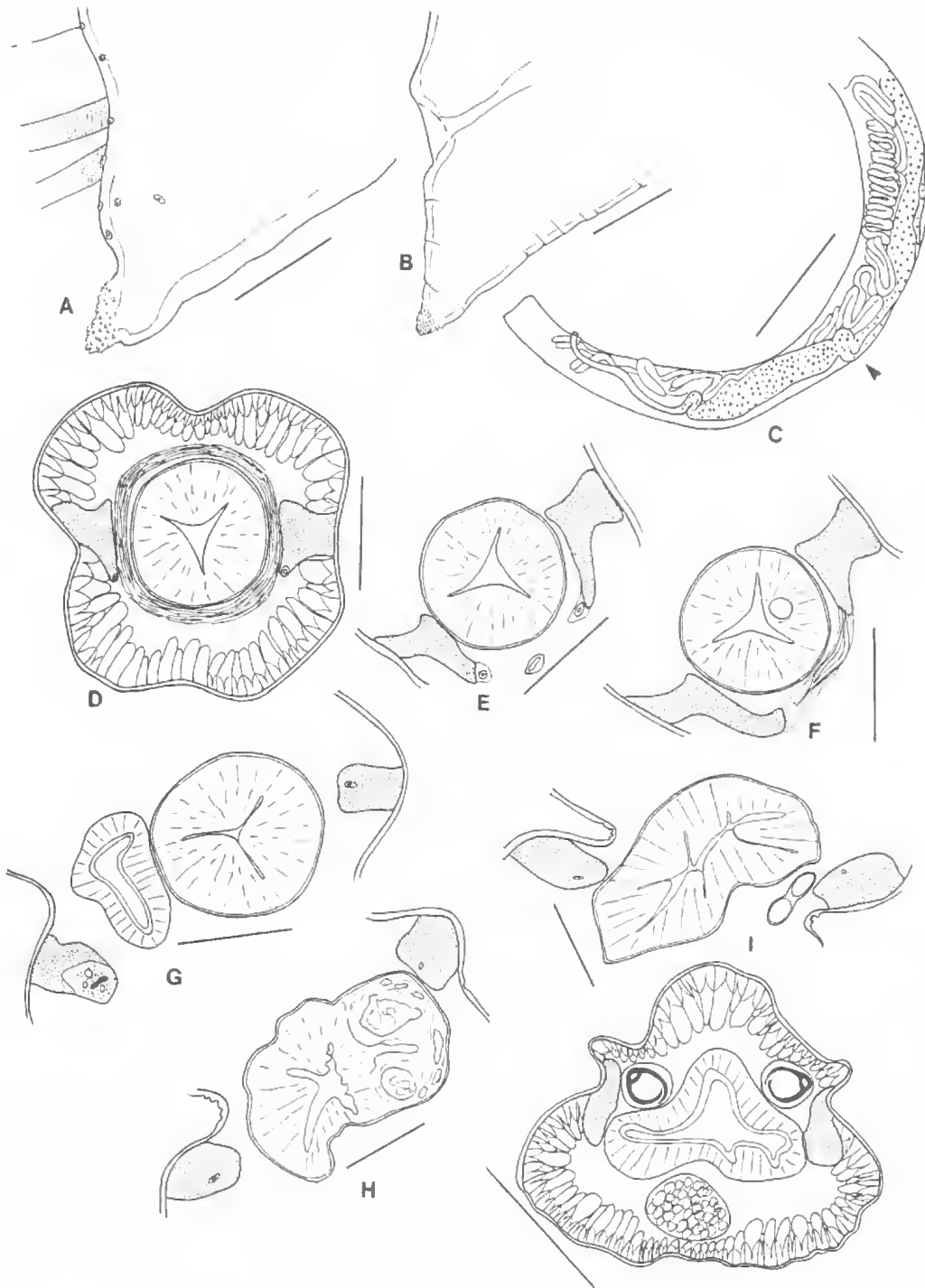


FIG. 3. *Hysterothylacium leptaspi* n. sp. A, tail, lateral view, holotype (scale 100 μ m); B, tail, lateral view, ♀ #7 (200 μ m); C, vagina and uterus, ♀ #6 (3.0 mm), arrow indicates point of division of uterus. Sections (all male): D, nerve ring (100 μ m); E, excretory duct (100 μ m); F, excretory commissure (100 μ m); G, excretory nucleus (100 μ m); H, ventriculus (100 μ m); I, ventricular appendix (100 μ m); J, tail (0.5 mm).

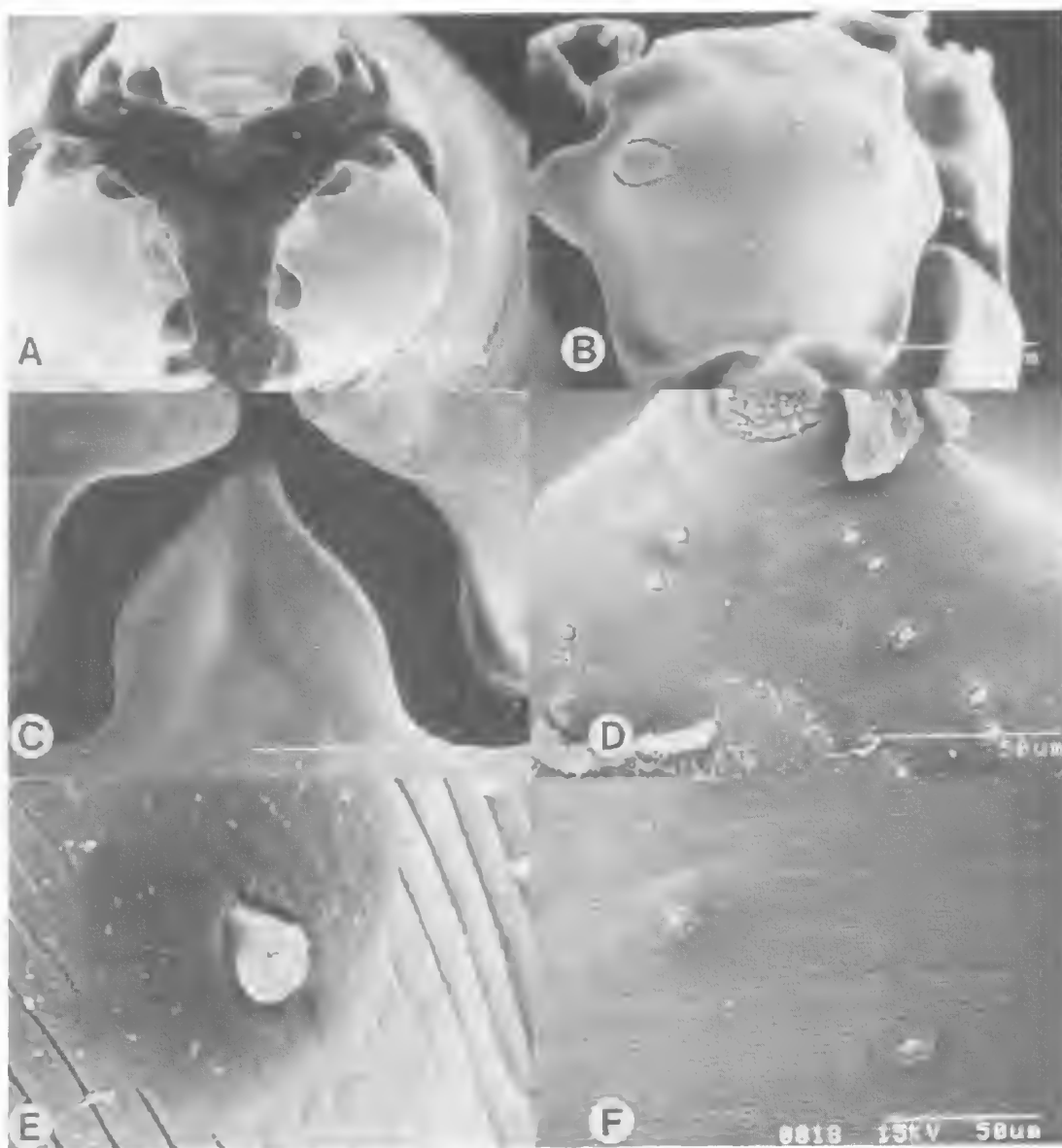


FIG. 4. *Hysterothylacium leptaspi* n. sp. Scanning electron micrographs. A, en face; B, dorsal lip; C, interlabium; D, postcloacal papillae; E, precloacal papilla, #6; F, precloacal papillae, c. #20.

noted. The ventricular appendage is extremely long, and it is likely that the shorter lengths quoted here may be underestimated due to breakage. Lip width varied between being slightly wider and slightly shorter than long; this variation is entirely due to perspective when measured as the lateral flanges curve away from the point of view. The smallest male worm (27.5 mm) had the largest number of papillae pairs (66). The

largest male was proportionally the most slender. One male had a single double postcloacal papilla (Fig. 4D).

HOSTS

Presently recorded from *Arius leptaspi* and two single specimens only from *Arius thalassinus* (Rüppell).

DISTRIBUTION.

At present known only from Embley Estuary, Weipa, Queensland, but see 'Remarks.'

REMARKS

At a species level there are problems posed in the determination of this species. *Hysterothylacium arii* (Yamaguti, 1954) was taken from an unidentified species of *Arius* from Sulawesi. There are several points of agreement with Yamaguti's (1954) description: long caecum, very long ventricular appendage; postlabial grooves; lip shape; tail apex. There are equally several points of distinction, Yamaguti's species being described as having alae, longer spicules, and fewer caudal papillae. Without access to Yamaguti's type material (see Bruce and Cannon, 1989), the recorded differences force the conclusion that the two species are distinct.

Amplificaecum indica Srivastava and Gupta, 1975, is a more recently described species from *Arius venosus* from India. The description consists largely of family characters, and the figures do not illustrate in detail the characters needed to assess the correct generic position of the species, or to compare with *C. leptaspis*. Srivastava and Gupta (1975) state clearly that their single male specimen was 'without posterior bulb' and therefore also without a ventricular appendage. These authors did not state the disposition of their material and further comparisons between these apparently similar species cannot be made. In view of the stated difference (lack of ventriculus), the two species cannot be considered congeneric.

Australia has over 18 species in the catfish family Ariidae (Kailola and Pierce, 1988) and a further 130 species are known world wide (Sands, 1985). With little data on host specificity it is not possible to assume that worms from congeneric hosts are the same species or belong to the same genus. In Australia at least four species of ascaridoid have been recorded from *Arius* species.

It should be noted that the ventriculus and ventricular appendage in this species is difficult to observe, and in all cases dissection was necessary. The ventriculus is small and clear, and merges gradually into the ventricular appendage. The ventricular appendage is very flat (Fig. 31) and transparent (in section it appears hollow), and appears to adhere closely to the lateral cord, being only clearly visible where gently separated away.

Hysterothylacium leptaspis is readily distinguished from all other species of the genus by

complete lack of alae, and from those species for which the excretory system has been described by having an distinctly H-shaped excretory system. *Hysterothylacium* most commonly have a purely unilateral system, sometimes retaining traces of the left posterior filament. The excretory system of the type species *H. brachyurum* Ward and Magath, 1917 remains undescribed.

***Hysterothylacium chrysostomi* n. sp.**
(Fig. 5)

MATERIAL EXAMINED

Male HOLOTYPE (QM GL10251), (female PARATYPE (QM GL10252) off Dongara, Western Australia, 10 Dec. 1987, stomach of *Lethrinus chrysostomus*, coll. A. Williams.

TYPE LOCALITY

Dongara, Western Australia

TYPE HOST

Lethrinus chrysostomus Richardson, Lethrinidae.

DIAGNOSIS

Cuticle annulated. Lips with length to width ratio 1: 1.2-1.7, with deep postlabial grooves; laterally constricted at about 0.3 length from anterior. Alae present, not expanded, originate just posterior to base of subventral lips. Spicules 4.3-4.5% BL; ratio of 1: 1.02. Caudal papillae pairs: precloacal 30-32, paracloacal 2, postcloacal 9-10.

DESCRIPTION

Based on male holotype and female paratype.

General. Body reaching greatest width anterior to mid-body. Dorsal lip smaller than subventrals, shorter than wide (0.63); flanges widest at posterior third of lip. Interlabia large, lateral margin weakly convex, basally wider than long. Oesophagus 8.9-10.8% BL. Ventriculus slightly narrower than widest level of oesophagus, longer than wide. Ventricular appendix 33.9-38.8% length of oesophagus. Nerve ring lying between anterior 21.4-22.5% of oesophagus. Excretory system with pore to just posterior to nerve ring.

Male. Body 21.4 mm long, 470 maximum width; width at oesophageo-intestinal junction 282. Ratio of greatest width to length 1: 45.6. Subventral lip 78 long by 91 wide. Nerve ring 517 from anterior; excretory pore 696 from anterior. Oesophagus 2303 long by 188 wide.

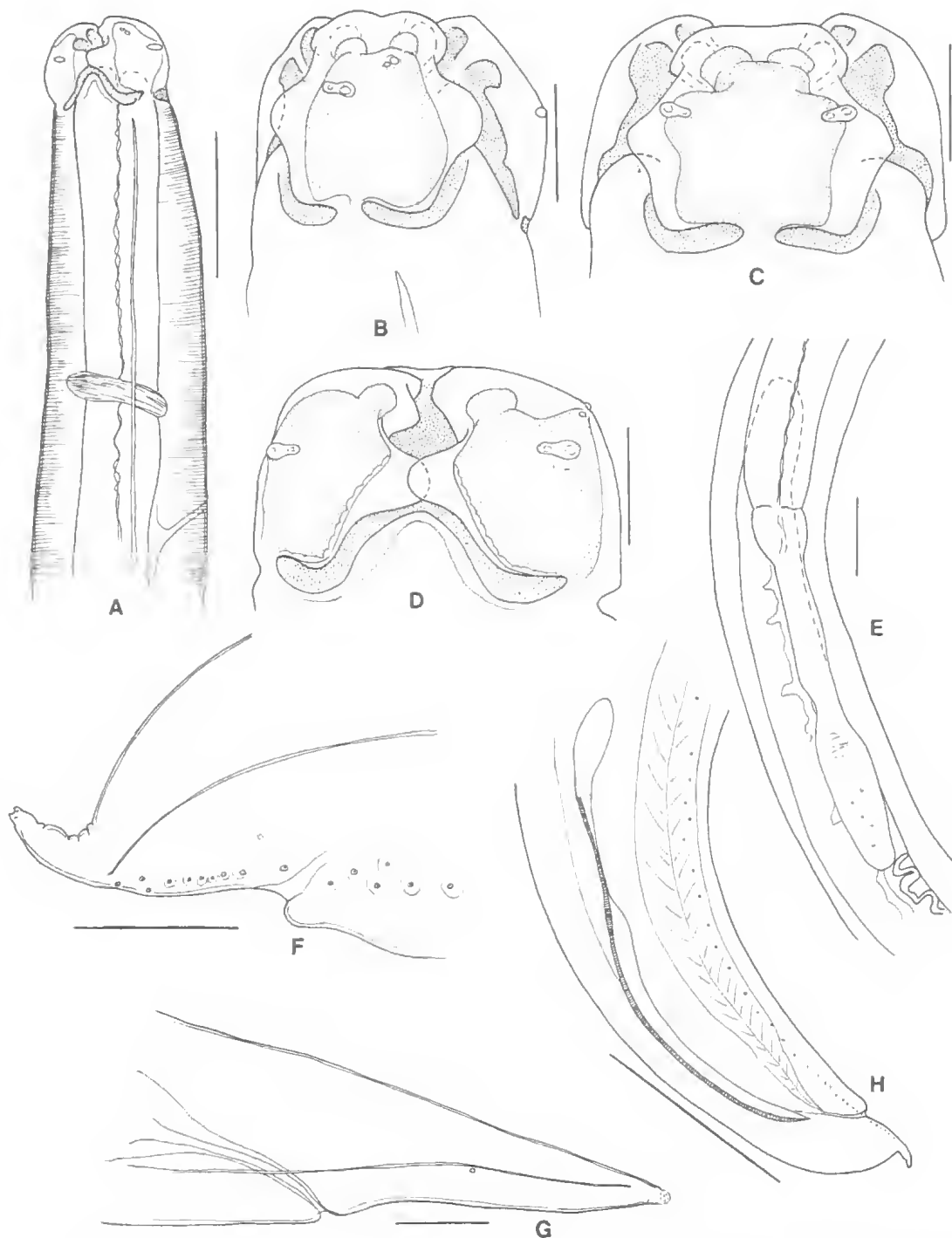


FIG. 5. *Hysterothylacium chrysostomi* n. sp. All figs of male holotype except where indicated. A, anterior (scale 200 μ m); B, subventral lip (50 μ m); C, dorsal lip, ♀ (50 μ m); D, interlabium, ♀ (50 μ m); E, ventricular region (200 μ m); F, tail, lateral view (100 μ m); G, tail, ♀ (100 μ m); H, caudal region (0.50 mm).

Ventriculus 165 long by 188 wide; ventricular appendix 893 long by 85 wide, posterior half wider than anterior. Intestinal caecum 348 long by 141 wide; 15.1% oesophageal length. Ejaculatory duct 2350 mm long, 11.0% BL. Spicules 940-959 long, 40.0-40.8% ED. Caudal papillae pairs 42-45, becoming mamillate at about 6th or 7th anterior to cloaca. No double papillae discerned in lateral view. Tail 165 long, with weakly nodulose truncated mucron.

Female. Body 29.7 mm long, 517 maximum width; width at oesophago-intestinal junction 385; ratio of greatest width to length 1: 57.4. Dorsal lip 94 long by 150 wide; subventral lip 127 long by 160 wide. Nerve ring 564 from anterior. Excretory pore 658 from anterior. Oesophagus 2632 long by 188 wide. Ventriculus 169 long by 160 wide; ventricular appendix 893 long by 86 wide. Intestinal caecum 423 long by 179 wide; 33.9% oesophageal length. Vulva opening 11.0 mm from anterior or 37.0% BL from anterior extremity; vulva area not swollen. Vagina about (estimated) 940 long. Tail 400 long, with rounded minutely nodulose tip.

HOSTS

Known only from the type host.

REMARKS

There are numerous species of *Hysterothylacium* and related genera described from the Indian and Pacific Oceans that are inadequately described (see Bruce and Cannon, 1989, for discussion). Of those that can reasonably be inferred as belonging to *Hysterothylacium* only two seem close to the present species. *Hysterothylacium epinepheli* (Yamaguti, 1941) has a similarly shaped subventral lip, but differs by having more numerous precloacal papillae, fewer postcloacal papillae, a longer ventricular appendage and a less strongly constricted lip. Similar differences also separate *H. pagrosomi* (Yamaguti, 1935) from *H. chrysostomi*.

ETYMOLOGY

The epithet is taken from the host species epithet.

Hysterothylacium sebae n. sp.
(Figs 6-8)

MATERIAL EXAMINED

Male, HOLOTYPE, Bundaberg, eastern Queensland, 14 Jun. 1976, intestine of *Lutjanus sebae* (QM

GL10253). PARATYPES 2 males, 2 females, same data as holotype (QM GI 10254).

TYPE LOCALITY

Off Bundaberg, Queensland; no more precise locality data was available.

TYPE HOST

Lutjanus sebae (Cuvier), Lutjanidae.

DIAGNOSIS

Cuticle distinctly annulated. Lips with length to width ratio of 1: 0.72-0.80, with indistinct postlabial groove. Anterior half of lip approximately rectangular; flanges approximately triangular, anterior margin thickened. Cervical alae not evident; posteriorly alae distinct. Caudal papillae pairs: precloacal 19-20, paracloacal 1 double, postcloacal 2. Medioventral precloacal papilla present. Postcloacal pad absent. Spicules approximately equal in length, 1.8-2.9% BL. Tail apex acute, unornamented.

DESCRIPTION

Based on 2 mature males and 2 mature females.

General. Body thickest in middle half, anteriorly and posteriorly slender. Dorsal lip slightly shorter than subventrals, shorter than wide (0.72 width); flanges widest at posterior 0.28-0.30 of lips; lateral constriction not strongly developed. Interlabia sessile, short. Oesophagus 9.6-14.9% BL. Ventriculus narrower than widest level of oesophagus, narrower than long. Ventricular appendix 15.5-17.3% oesophageal length. Nerve ring lying between anterior 14.9-17.3% of oesophagus. Excretory system with pore opening posterior to nerve ring, otherwise unobserved.

Male. Body 38.5-39.2 mm, 771-799 maximum width; width at oesophago-intestinal junction 508-470; ratio of greatest width to length 1: 49-50. Dorsal lip not measured. Subventral lips 146-188 long by 189-235 wide. Nerve ring 658 from anterior. Excretory pore 752 from anterior (one specimen). Oesophagus 3807-4277 long by 301-348 maximum width. Ventriculus 282-301 long by 244-273 wide; ventricular appendix 658-733 long by 56 wide. Intestinal caecum 226-282 long by 197-207 wide, 5.3-7.4% oesophagus length. Ejaculatory duct 2256-2444 long, 5.9-6.2% BL. Spicules 658-1128 long, 29.2-45.3% ED. Caudal papillae pairs 22-23, changing to mamillate at about 5th anterior to cloaca. Tail 207-226 long, apex acute, unornamented.

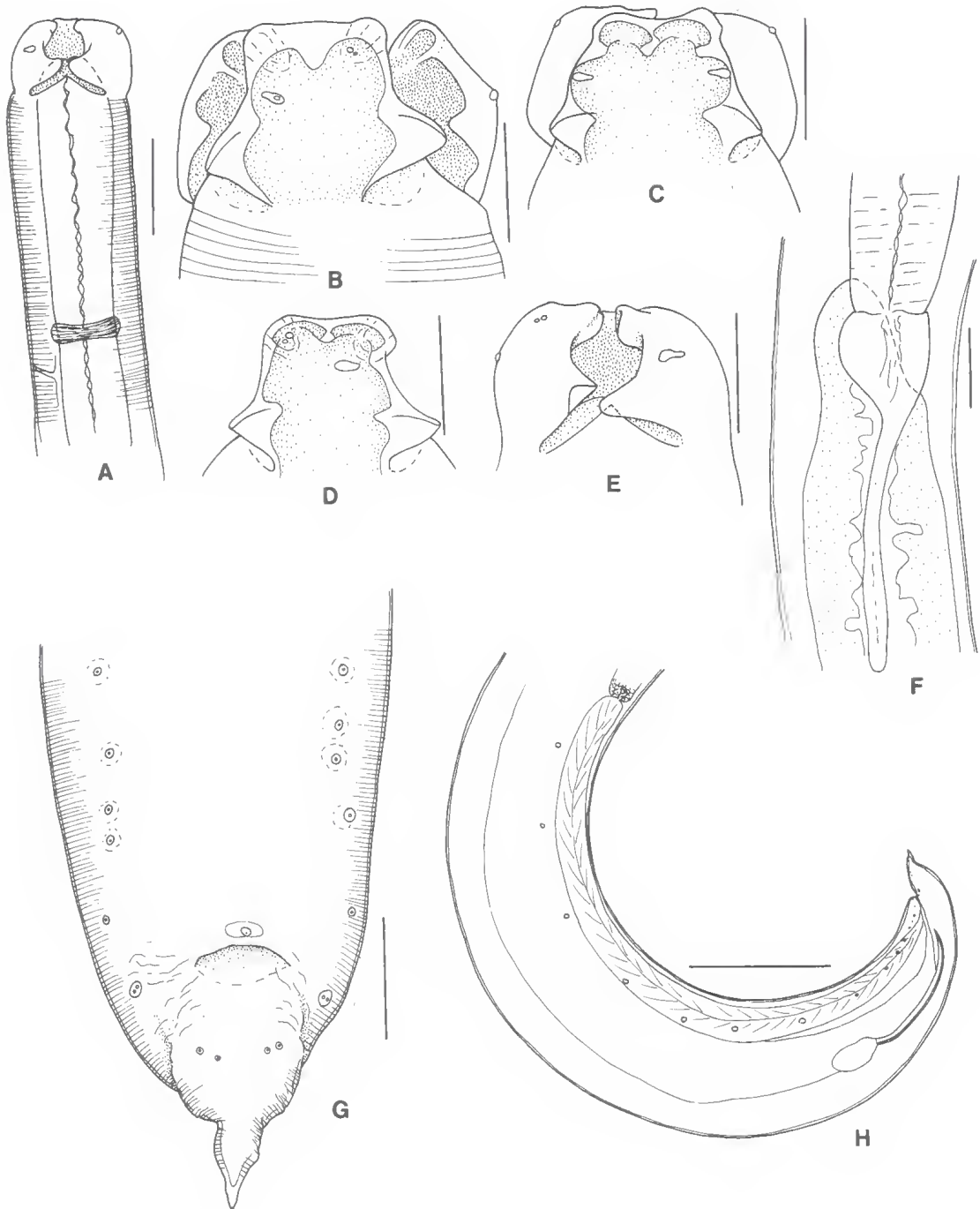


FIG. 6. *Hysterothylacium sebae* n. sp. A, anterior, holotype (scale 200 μ m); B, subventral lip, holotype (100 μ m); C, dorsal lip, ♀ #1 (100 μ m); D, subventral lip, ♀ #1 (100 μ m); E, subventral interlabium, ♀ #1 (100 μ m); F, ventricular region, holotype (200 μ m); G, tail, ventral view, ♂ #2 (100 μ m); H, caudal region (0.50 mm).

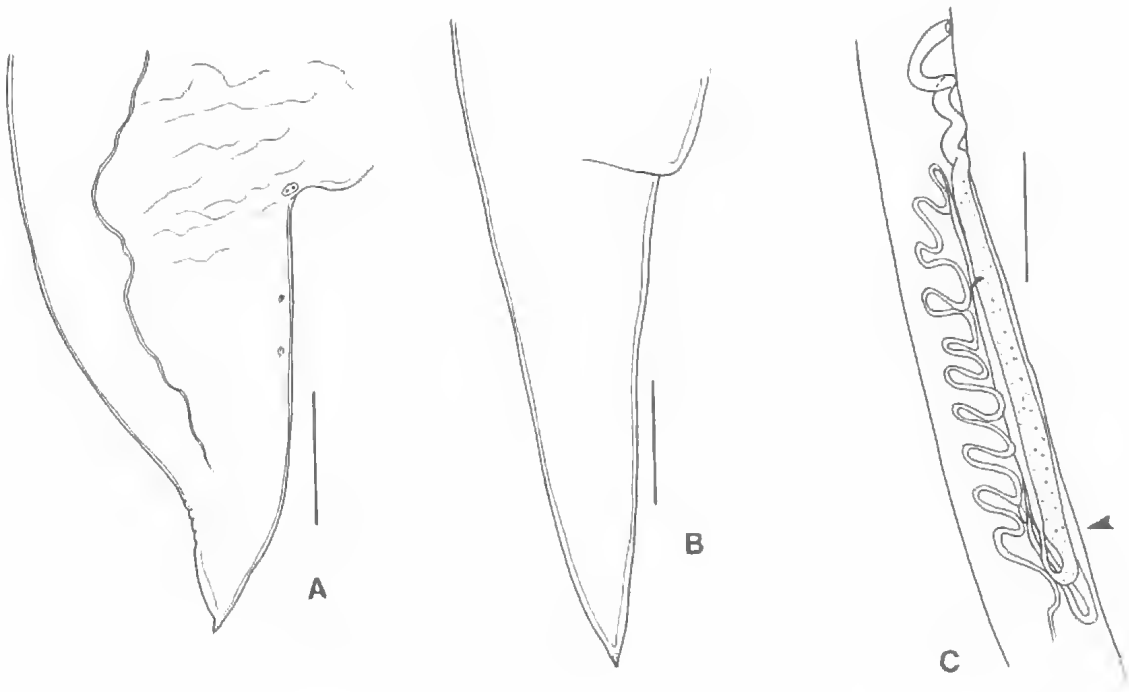


FIG. 7. *Hysterothylacium sebae* n. sp. A, tail, lateral view, holotype (scale 50 μ m); B, tail, lateral view, ♀ #2 (100 μ m); C, vagina and uterus, ♀ #1 (1.0 mm), arrow indicates point of division of uterus.

Female. Body 42.5-45.2 mm long, 752-818 maximum width; width at oesophageo-intestinal junction 564-658; ratio of greatest width to length 1:60.0. Dorsal lip 160 long by 221 wide (one specimen). Subventral lips 165-174 long by 211-226 wide. Nerve ring 658-667 from anterior. Excretory pore not located. Oesophagus 4234-4418 long by 320-404 maximum width. Ventriculus 329-376 wide by 282-338 long; ventricular appendix 658-752 long by 66-69 wide. Intestinal caecum 226-329 long by 179-216 wide, 5.1-7.8% oesophagus length. Vulva opening 13.5-14.8 mm or 31.8-32.8% BL from anterior. Vagina 1320-1500 mm long; uterus 3.67-4.51 mm long, dividing 4.98-6.02 mm from vulva. Eggs not seen. Tail 376-409 long, apex acute, unornamented.

HOSTS

Known only from type host.

DISTRIBUTION

Known only from the type locality.

REMARKS

Distinctive characters shown by this species

are the shape of the dorsal lip, lack of obvious cervical alae, and the distinctive tail shape with an unornamented apex. Recent work (Bruce and Cannon, 1989) indicate that the morphology of alae is constant within a species of a sibling complex, such as the species of *Maricostula*, once the species have been discriminated. At present there is no species of *Hysterothylacium* that shows any degree of close similarity to this species. To my knowledge no species of *Hysterothylacium* has been specifically recorded from Lutjanidae.

Scanning electron micrographs show cuticular features not observed by light microscopy. The tail, while having a simple tip has a nodular patch on the ventral side (Fig. 8B). Immediately posterior to this terminal 'cone' or 'cactus' is an area in which striae form ridges; the dorsal surface of the cuticle anterior to cloaca has fine ridges, but these do not constitute crests in the sense of Bruce and Cannon (1989). Unfortunately the material examined was in only adequate condition and it was not possible to examine the anterior of the specimen. Similarly the fixation was not of a standard that would have allowed interpretable sections.

ETYMOLOGY

Named after the host species.

Hysterothylacium tasmaniense
(Johnston and Mawson) n. comb.
(Figs 9-11)

Contracaecum (*Thynnascaris*) *tasmaniense* Johnston
and Mawson, 1945: 134, Figs 24-27.- Korotaeva

and Leont'eva, 1972: 404; Deardorff and Overstreet, 1981: 1044.

Contracaecum tasmaniense.- Mozgovoi, 1953: 229;
Yamaguti, 1961b: 30.

Thynnascaris tasmaniense.- Beumer *et al.*, 1982: 22.

MATERIAL EXAMINED

8 males, 5 females, one 4th, from Tamar River
(estuary presumably), Tasmania, 30 Nov. 1983, from

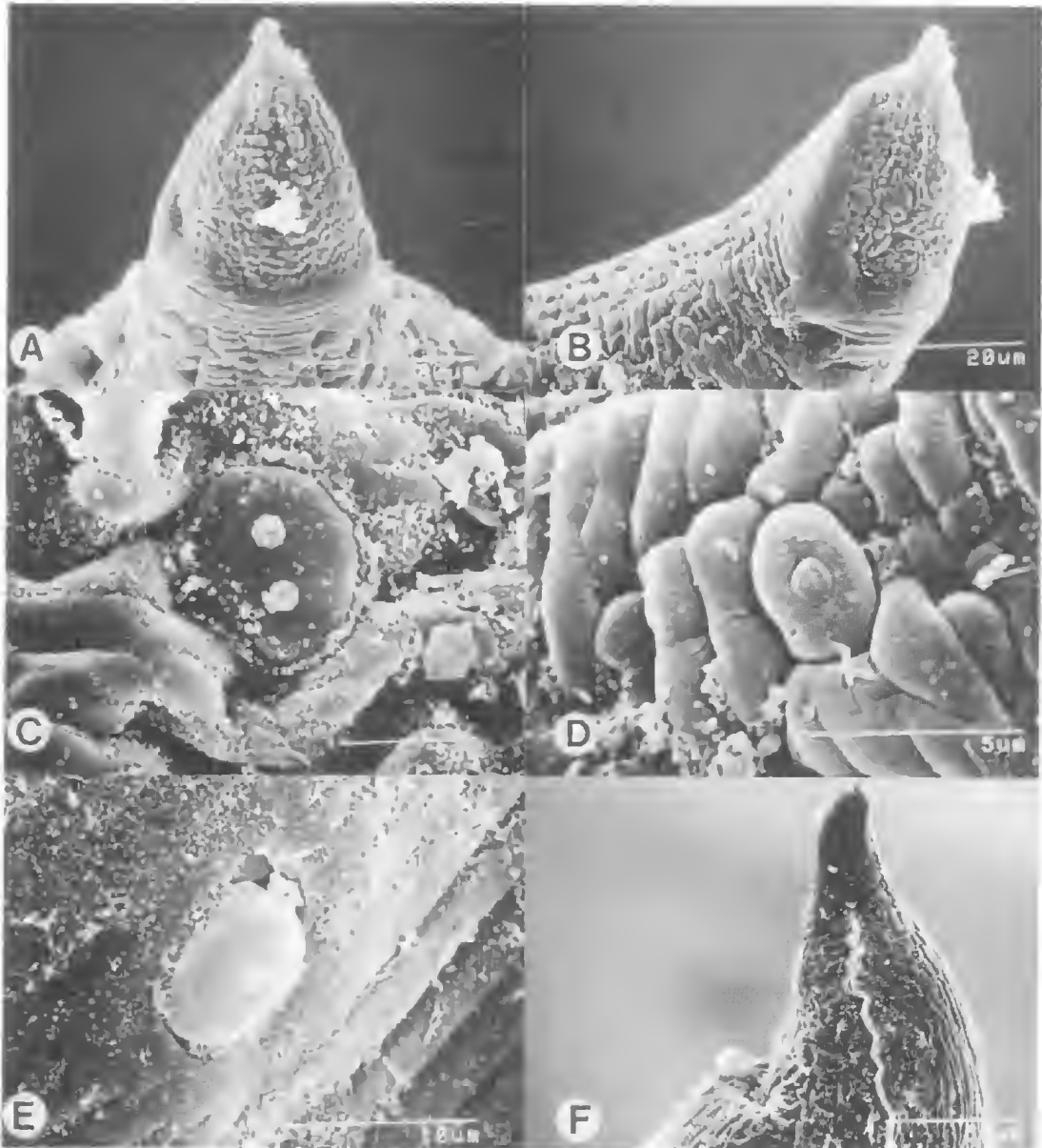


FIG. 8. *Hysterothylacium sebae* n. sp. Scanning electron micrographs. A, tail apex, cactus; B, cactus lateral view; C, double papilla; D, amphid (positioned dorsal to ala); E, precloacal papilla, #6; F, tail, lateral.

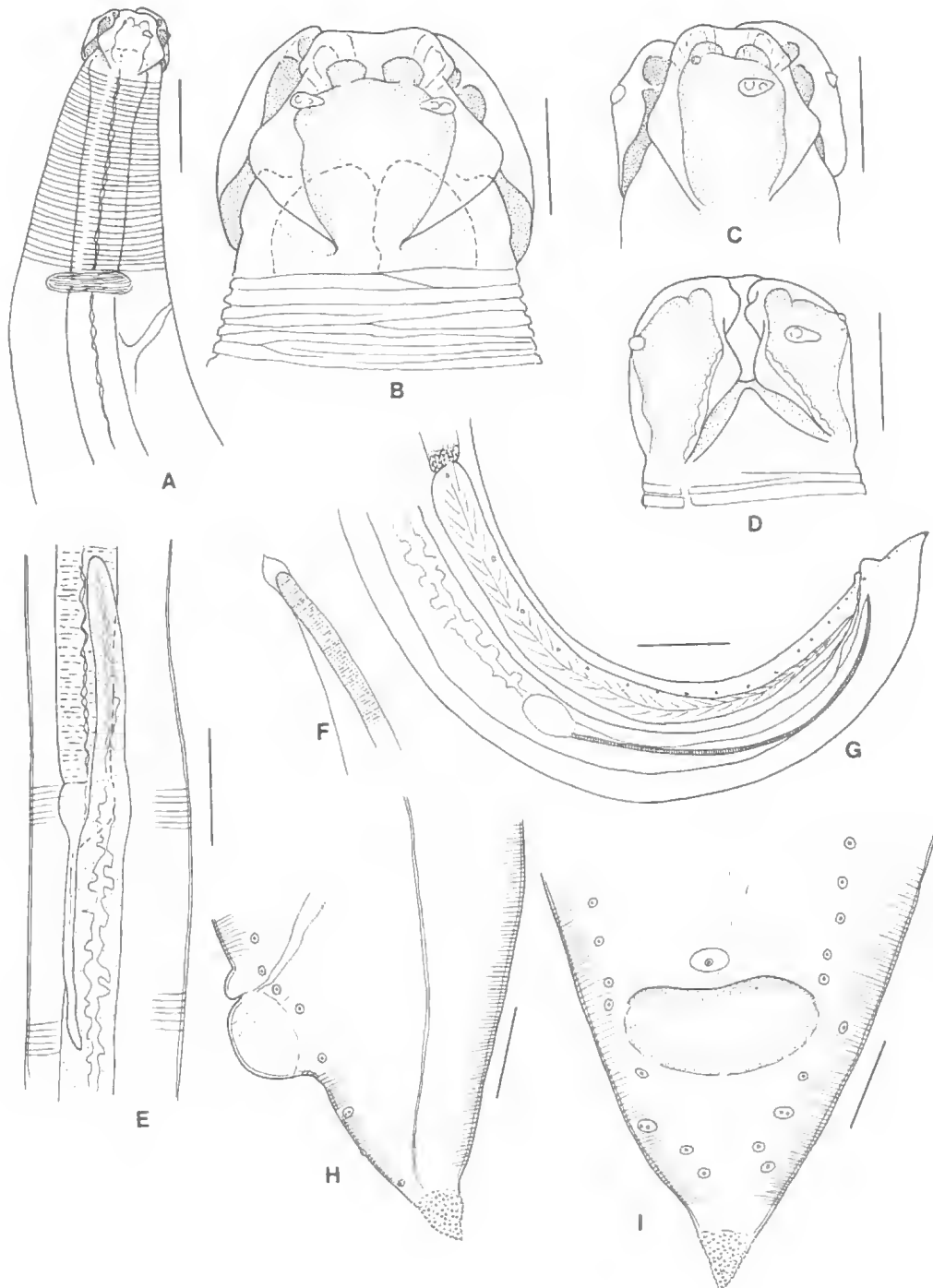


FIG. 9. *Hysterothylacium tasmaniense*. Figs all ♂ #1 except where indicated. A, anterior ♀ #1 (scale 100 µm); B, dorsal lip, ♂ #2 (75 µm); C, subventral lip (100 µm); D, ventral interlabium (100 µm); E, ventricular region (200 µm); F, spicule apex, ♂ #4; G, caudal region (300 µm); H, tail, lateral view (100 µm); I, tail, ventral view, ♂ #2 (100 µm).

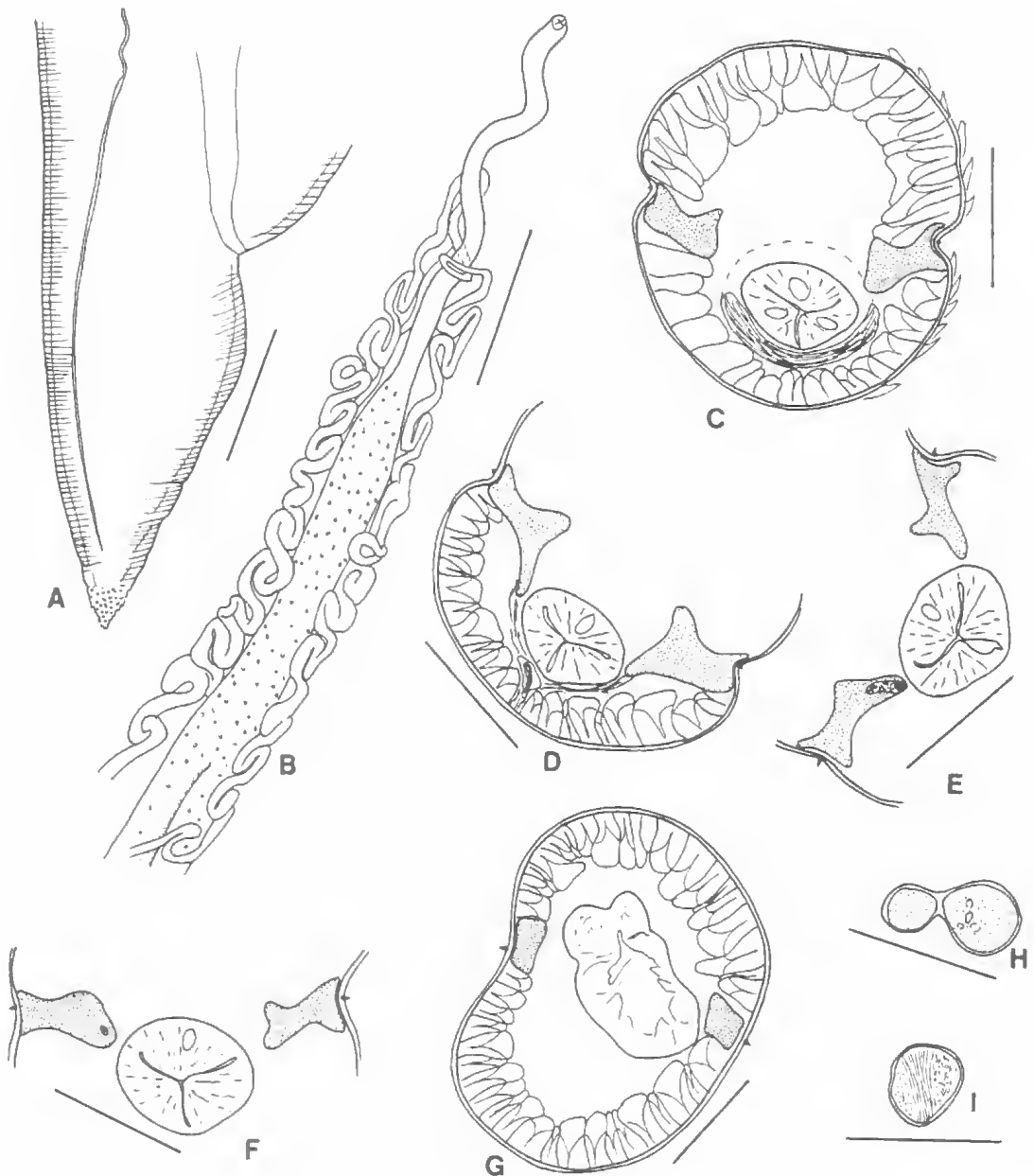
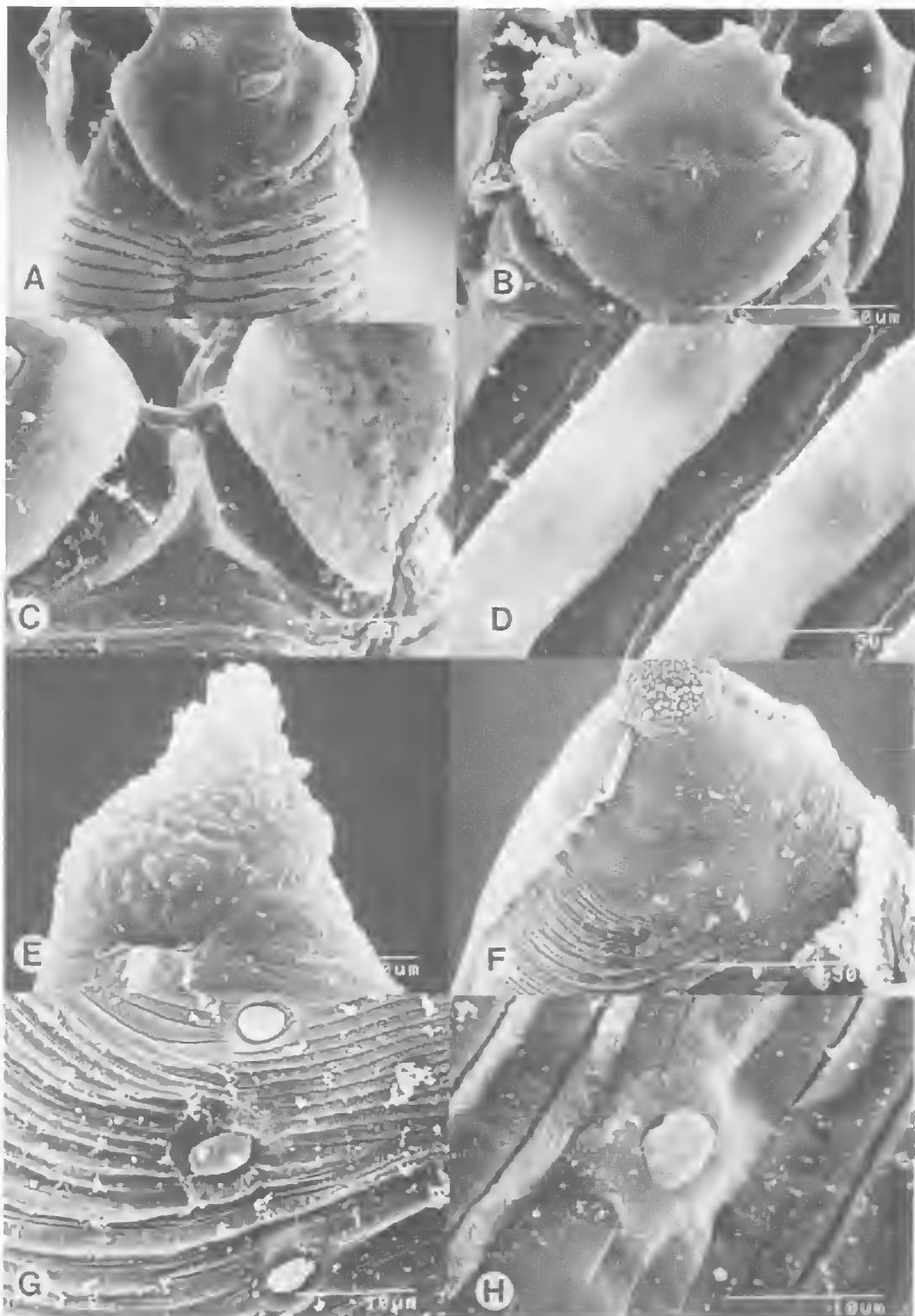


FIG. 10. *Hysterothylacium tasmaniense*. A, tail, lateral view, ♀ #1 (scale 100 μm); B, vagina and uterus, ♀ #3 (0.50 m). Sections (scales all 100 μm): C, nerve ring; D, excretory duct; E, excretory nucleus; F, mid oesophagus; G, ventriculus; H, anterior ventricular appendix; I, posterior ventricular appendix.

FIG. 11. *Hysterothylacium tasmaniense*. Scanning electron micrographs. A, anterior and subventral lip; B, dorsal lip; C, interlabium; D, cuticular rings, detail; E, cactus; F, tail; G, postcloacal papillae; H, precloacal papilla #12.



Pseudophycis barbata (AHC 16494, one pair and 4th QM GL10255).

TYPES

Johnston and Mawson (1945) did not specify types. Their syntype material was reported to be held at the South Australian Museum, Adelaide, but could not be located.

TYPE LOCALITY

The material examined by Johnston and Mawson was all from one station. This then is the type locality with the co-ordinates 42°40.0'S, 148°27.5'E.

TYPE HOST

The original description was based on material from two species of host, and neither was designated as type host.

DIAGNOSIS

Cuticle with prominent cervical rings. Lips with length to width ratio 1: 1.0-1.3 (mean = 1.10), posteriorly pedunculate; without postlabial grooves; weakly constricted about 0.3 length from anterior; flanges forming broadly rounded points. Alae not evident anteriorly; alar grooves run from base of each subventral lip, become evident as alae towards posterior. Caudal papillae pairs: precloacal 18-25, paracloacal 1, postcloacal 4-5 with 2nd doubled. Spicules approximately equal in length, ratio of 1: 1.03-1.08; 4.9-6.4% BL. Tail narrowing evenly, apex covered with fine nodules.

DESCRIPTION

Based on 6 mature males and 3 mature females.

General. Body reaching greatest width about midbody. Dorsal lip slightly smaller than subventrals, usually slightly shorter than wide (0.75-0.83, 2 specimens); flanges widest at posterior 0.3 of lip; lips laterally constricted about anterior 0.3 of lip. Interlabia triangular, sessile, about twice as wide basally as long. Oesophagus 7.88-11.4% BL. Ventriculus narrower than widest level of oesophagus, slightly longer than wide. Ventricular appendix 21.3-47.1% length of oesophagus. Nerve ring lying between anterior 18.3-21.7% of oesophagus. Excretory system with pore immediately posterior to nerve ring, posteriorly unilateral, without anterior filament; excretory nucleus immediately posterior to commissure.

Male. Body 18.2-40.0 mm long, 376-799 maximum width; width at oesophageo-intestinal

junction 282-461; ratio of greatest width to length 1: 48-79 (mean = 1: 60). Dorsal lip 132 long, 165 wide (1 specimen); subventral lips 103-150 long by 103-165 wide. Oesophagus 2068-3243 long by 122-235 wide. Ventriculus 103-141 long by 103-165 wide; ventricular appendix 555-1269 long, 28-103 wide; 21.3-29.5% (mean = 26.8%) oesophageal length. Intestinal caecum 611-799 long, 75-113 wide, 23.7-33.1% (mean = 26.4%) oesophageal length. Ejaculatory duct 5.9-7.9% BL (mean = 6.5%). Spicules 1504-2350 long, 63.3-97.4% ED. Caudal papillae pairs 26-31, changing from button to mamillate at about 9th anterior to cloaca. Tail 127-188 long, narrowing evenly, terminating in minutely nodulose apex. Medioventral papillated precloacal organ present; posterior of anus elevated.

Female. Body 22.0-35.0 mm long, 376-611 maximum width; width at oesophageo-intestinal junction 282-517; ratio of greatest width to length 1: 55.4-62.1 (mean = 59.4). Dorsal lip 89 long by 118 wide (one specimen); subventral lips 99-141 long by 103-160 wide. Nerve ring 446-634 from anterior. Excretory pore 517-658 from anterior. Oesophagus 2162-2914 long by 141-207 wide. Ventriculus 89-235 long by 99-179 wide; ventricular appendix 611-799 long by 28-66 wide; 22.5-28.3% (mean = 26.1%) oesophageal length. Intestinal caecum 630-893 long by 75-132 wide; 26.5-30.6% (mean = 28.9%) oesophageal length. Vulva opening 8.8-11.7 mm or 31.5-38.6% BL from anterior extremity; vulva area not swollen. Vagina short, 1-2 mm in length, ovaries not extending beyond vulva; uterus divides 2.7 mm from vulva (smallest specimen). Eggs about 56 in diameter. Tail 282-846 long, tapering gradually, apex minutely nodulose.

Variation. All but one male had the spicules shorter than the ejaculatory duct. In the differing male both spicules were about 130% the length of the ejaculatory duct. This male also had an abruptly narrower head than neck. In one specimen the ventricular appendage was markedly longer, 47% oesophageal length. The ventricular appendage and intestinal caecum are of about equal length, with the caecum usually (5 of 9) slightly longer than the ventricular appendage.

HOSTS

Present material is from *Pseudophycis barbata* Günther (Moridae, Gadiformes). Johnston and Mawson's (1945) record was from *Coelorhynchus australis* (Richardson) (Macrouridae,

also Gadiformes) and *Notopogon lillei* Regan (Macrorhamphoridae, Syngnathiformes). Korotaeva and Leont'eva (1972) recorded *Macruronus novaezelandiae*.

DISTRIBUTION

Type locality, New Zealand (Korotaeva and Leont'eva, 1972) and now from the Tamar River, Tasmania.

REMARKS

Johnston and Mawson (1945) described *Hysterothylacium tasmaniense* from immature females. Their illustrations were few, but there are several points of correspondence between present material and the original description. Lip shape, lack of distinct postlabial grooves, interlabium shape, the relative proportions of the intestinal caecum and ventricular appendage and the prominent cuticular rings all serve to identify this species.

The most similar species to *Hysterothylacium tasmaniense* appears to be *Hysterothylacium aduncum*. Descriptive accounts and figures for this species are given by Punt (1941), Petter (1969), Petter and Maillard (1988). Berland (1961) give a detailed account of that species. Points in common that suggest that the two species are closely related are the lip shape, relative proportions of the intestinal caecum and ventricular appendage, papillae details, shape and ornamentation of the tail. Although there are inconsistencies in descriptions of material previously recorded as *H. aduncum*, *H. tasmaniense* can consistently be separated by the lack of cervical alae, wider interlabia, conspicuous cervical rings, lack of postlabial grooves and more obviously constricted lips.

The prominent cuticular rings give this species a superficial resemblance to the monotypic genus *Iheringascaris* Peirera. In addition to the generic characters, the cuticular rings are themselves different between the two species, those of *Iheringascaris* overlapping posteriorly.

Hysterothylacium thalassini n. sp. (Fig. 12)

MATERIAL EXAMINED

All specimens from Albatross Bay, Weipa, Q., Gulf of Carpentaria, March 1987, from stomachs of *Arius thalassinus* trawled at depth of 36m, coll. CSIRO. Male HOLOTYPE, (QM GL10256), 6 females, PARATYPES QM GL10257, GL10258).

TYPE LOCALITY

Albatross Bay, Weipa, Queensland. Gulf of Carpentaria, 1240'S, 14142'E.

TYPE HOST

Arius thalassinus (Rüppell), Ariidae.

DIAGNOSIS

Cuticle distinctly annulated; lips with length to width ratio 1:1.05-1.23, with postlabial grooves, constricted a little less than one third (0.29) length from anterior. Alae originate just posterior to subventral lips. Ventricular appendage about 70% length of oesophagus, nearly as wide as oesophagus. Caudal papillae: precloacal 16, paracloacal 1, postcloacal 2. Spicules approximately equal in length, ratio of 1:1.11, 5.48-4.96% BL. Tail with conical nodulose apex.

DESCRIPTION

Based on one mature male and 4 mature females.

General. Body slender, about greatest width mid-body. Dorsal lip slightly smaller and basally manifestly wider than subventrals, about as long as wide; flanges widest about half way along length of lip, weakly developed. Interlabia sessile, less than half as long as lips. Oesophagus 10.6-15.6% BL. Ventriculus slightly wider than widest level of oesophagus, about as wide as long. Ventricular appendix 67.1-90.0% length of oesophagus. Nerve ring lying between anterior 11.9-16.4% length of oesophagus. Excretory system unilateral, with pore opening distinctly posterior to nerve ring.

Male. Body 18.0 mm long, 282 maximum width; width at oesophageo-intestinal junction 212; ratio of greatest width to length 1: 63.8. Dorsal lip 75 long by 71 wide. Subventral lips not measured. Nerve ring 400 from anterior. Excretory pore 494 from anterior. Oesophagus 2444 long by 112 wide. Ventriculus 118 long by 85 wide; ventricular appendix 2115 long by 103 wide. Caecum 1788 long by 94 wide, 73.1% oesophageal length. Ejaculatory duct 1128 long, 6.27% BL. Spicules 893-987 long, 79.2-87.5% ED. Caudal papillae 16-19. Tail 106 long.

Female. Body 19.4-27.1 mm long 320-470 maximum width; width at oesophageo-intestinal junction 216-348; ratio of greatest width to length 1: 44.2-72.1 (mean = 1: 58.3). Dorsal lip 66-99 long by 71-94 wide (2 specimens). Subventral lips 85-116 long by 71-94 wide (2 specimens). Nerve ring 329-447 from anterior. Excretory pore 353-517 from anterior.

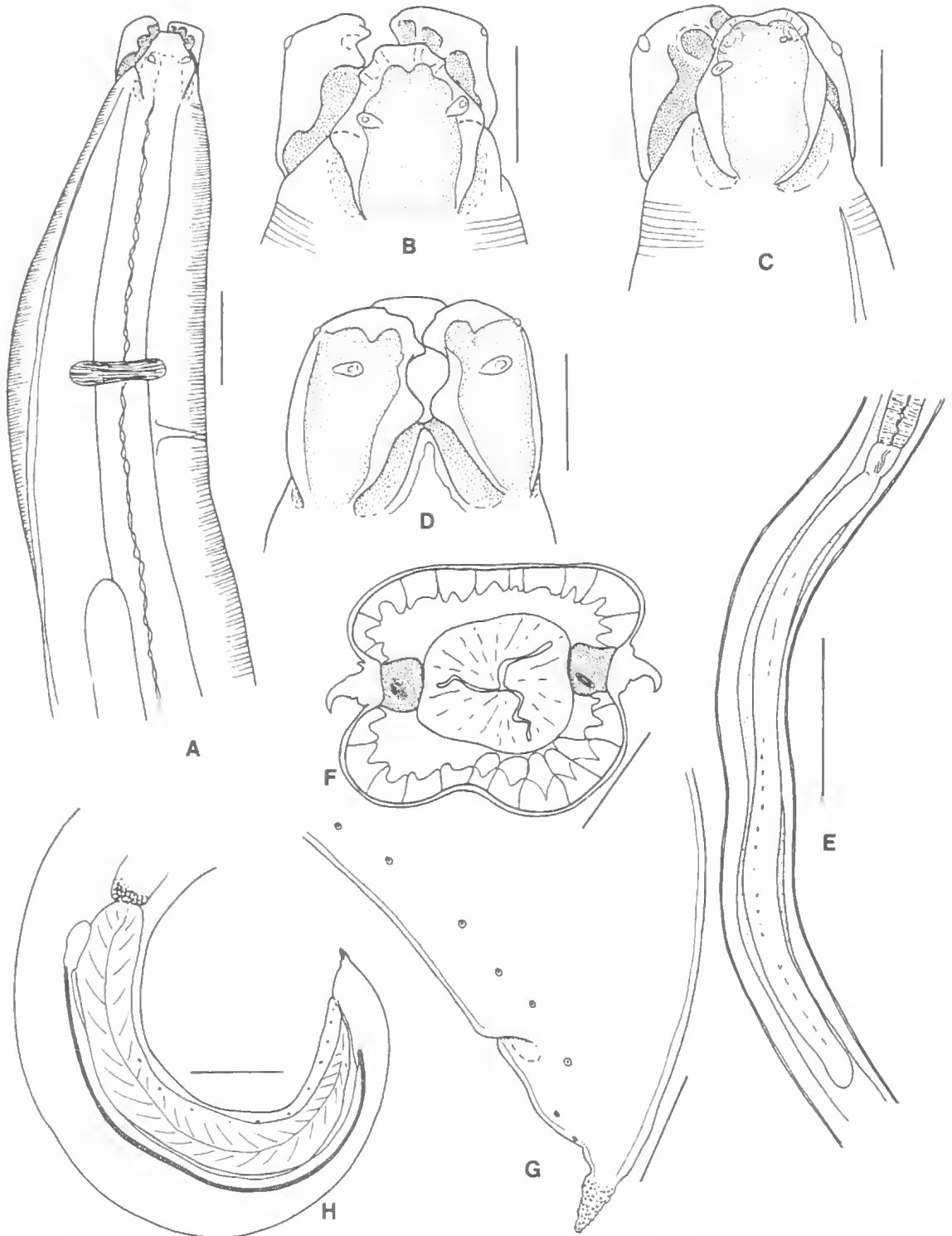


FIG. 12. *Hysterothylacium thalassini* n. sp. A, anterior, holotype (scale 100 μm); B, dorsal lip, holotype (50 μm); C, subventral lip, ♀ #3 (50 μm); D, ventral interlabium, ♀ #2 (50 μm); E, ventricular region holotype (0.5 mm); F, section, posterior to nerve ring (100 μm); G, tail, lateral view, holotype (50 μm); H, caudal region, holotype (200 μm).

Oesophagus 2350-3290 long by 103-132 wide. Ventriculus 94-141 long by 194-146 wide; ventricular appendix 1598-2538 long by 85-113 wide. Caecum 1739-2632 long by 94-169 wide; 74.0-80.0% BL (mean = 76.3%). Vulva opening 7.51-11.84 mm or 37.6-43.7% BL from anterior; vulva area not swollen. Vagina not measured accurately, approximately 1.3-2.2 mm long. Uterus didelphic, opisthodidelphic. Oviducts not extending anterior to vagina. Tail 235-282 long.

Variation. There was notable variation in the length to width ratio, with one specimen being distinctly more slender (1: 71.2) than the others (1:44.2-60.5). One specimen had a subventral lip length to width ratio of 1:0.93. With the limited material at hand no other particular variations were noted.

HOSTS

Known only from the type host. One female specimen from *Nemipterus hexodon* (Quoy and Gaimard) (Family Nemipteridae) was examined, and although similar, a positive determination could not be made.

REMARKS

This small species shows no particular affinity with any other member of the genus. The long and, compared to other species, wide ventricular appendage is a noteworthy character which, in combination with lip shape and caecal length, should ensure easy identification.

The state of preservation of these specimens was such that detailed histology was not successful therefore the position of the excretory nucleus remains undescribed. Similarly it was not possible to get accurate measurements of the female reproductive system nor obtain successful SEMs.

ETYMOLOGY

The epithet is taken from the species name of the type host.

Hysterothylacium zenis (Baylis) (Figs 13-15)

Contracaecum zenis Baylis, 1929: 547, Fig. 4.
Yamaguti, 1961b: 30.

Contracaecum (*Contracaecum*) *zenis*.- Mozgovoi, 1953: 168, Fig. 102.

Contracaecum zenopsis Yamaguti, 1941: 366, Fig. 24, plate V. Figs. 27-30.- 1961b: 30.

Contracaecum (*Contracaecum*) *zenopsis*.- Mozgovoi, 1953: 168, Fig. 103.

Hysterothylacium zenis.- Deardorff and Oversreet, 1981: 1042.

Hysterothylacium zenopsis.- Deardorff and Oversreet, 1981: 1042.

MATERIAL EXAMINED

8 males, 4 females, 3 fourths, off Townsville, Q., no date (but catalogue number implies circa 1982), from *Zenopsis nebulosus*, coll. J. Stevens, CSIRO (AHC 16332, one pair QM GL10259). Also examined: 4 syntypes.

TYPES

The syntypes of *H. zenis*, all female, are held at the BM(NH) 1934.9.29.51-54. The types of *H. zenopsis* are believed to be at the Meguro Parasitological Museum, Tokyo, where Yamaguti's nematode types were deposited (see Bruce and Cannon, 1989).

TYPE LOCALITY

Baylis cited only 'off South-west Africa, July 8, 1927'.

TYPE HOST

Zeus capensis, Zeidae (Baylis, 1929).

DIAGNOSIS

Cuticle finely annulated, lips with length to width ratio 1:0.72-0.90; with deep postlabial grooves; constricted about 0.3 length from anterior; dorsal lip flange approximately rectangular. Alae originate from and are united with subventral interlabia; expanded to about position of ventricular appendage. Caudal papillae pairs: precloacal: 24-29, paracloacal 1, postcloacal 6-7 of which 4th or 5th from cloaca is doubled. Spicules subequal in length, ratio of 1: 1.05-1.17; 4.67-7.08% BL. Tail narrowing evenly to bluntly rounded apex, provided with small finely nodulose nipple like process.

DESCRIPTION

Based on 4 mature males and 2 mature females.

General. Body reaching greatest width about mid-body. Dorsal lip slightly larger than subventrals, usually slightly shorter than wide (0.72-0.81); flanges widest at posterior two thirds of lip; lips laterally constricted about anterior 0.34-0.37 of lip. Ventral interlabium about 1.3-1.5 long as basal width. Oesophagus 12.1-16.5% BL. Ventriculus narrower than widest level of oesophagus, wider than long. Ventricular appendix 25.0-34.3% length of oesophagus. Nerve ring lying between anterior 7.66-10.18% of

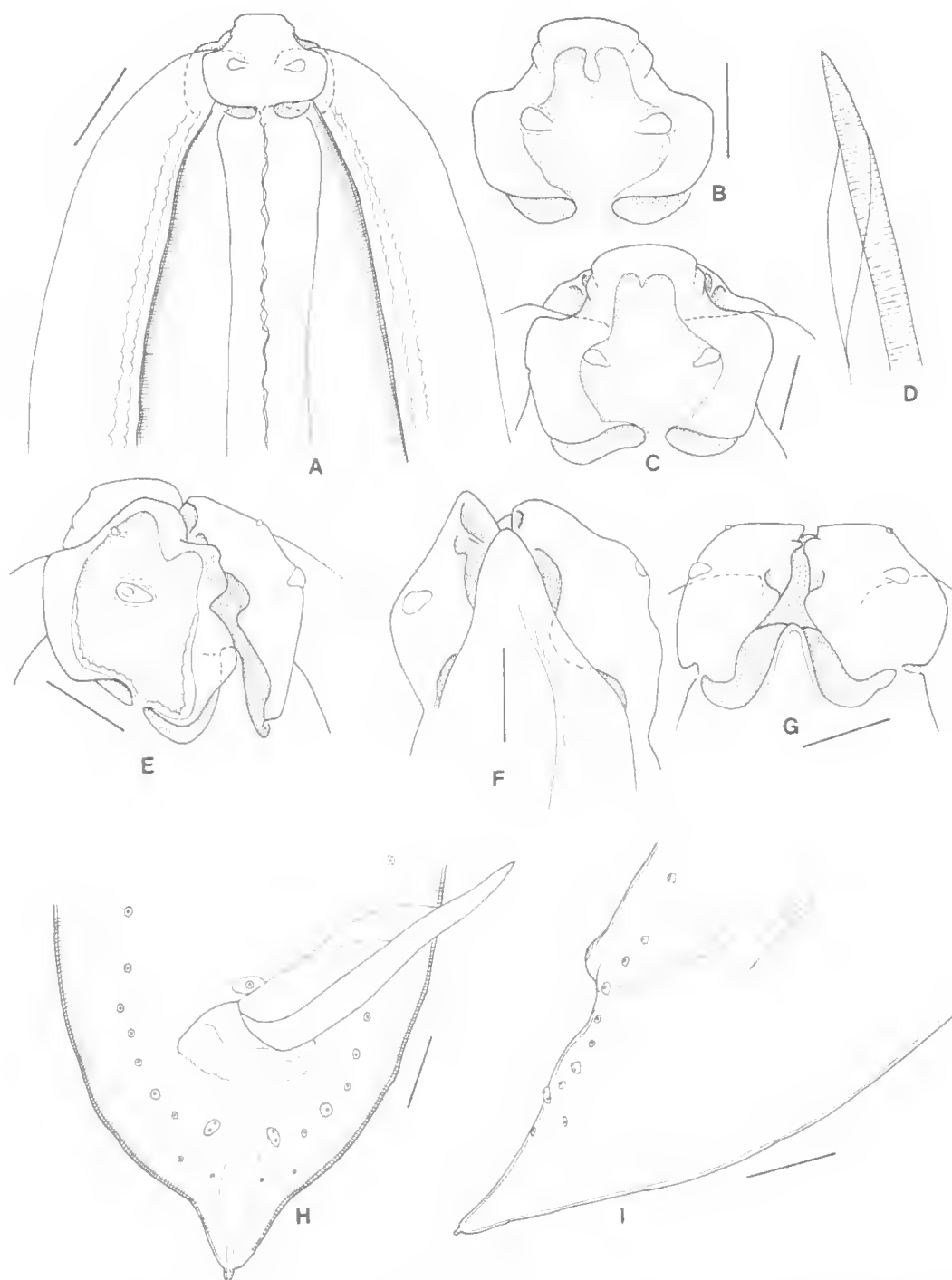


FIG. 13. *Hysterothylacium zenis*. A, anterior, ♂ #1 (scale 100 μ m); B, dorsal lip, ♂ #1 (50 μ m); C, dorsal lip, ♀ #1 (50 μ m); D, spicule apex, ♂ #2; E, subventral lip, ♂ #1 (50 μ m); F, subventral interlabium/ala, ♂ #1 (50 μ m); G, ventral interlabium, ♂ #2 (50 μ m); H, tail, ventral view, ♂ #2 (50 μ m); I, tail, lateral view, ♂ #3 (50 μ m).

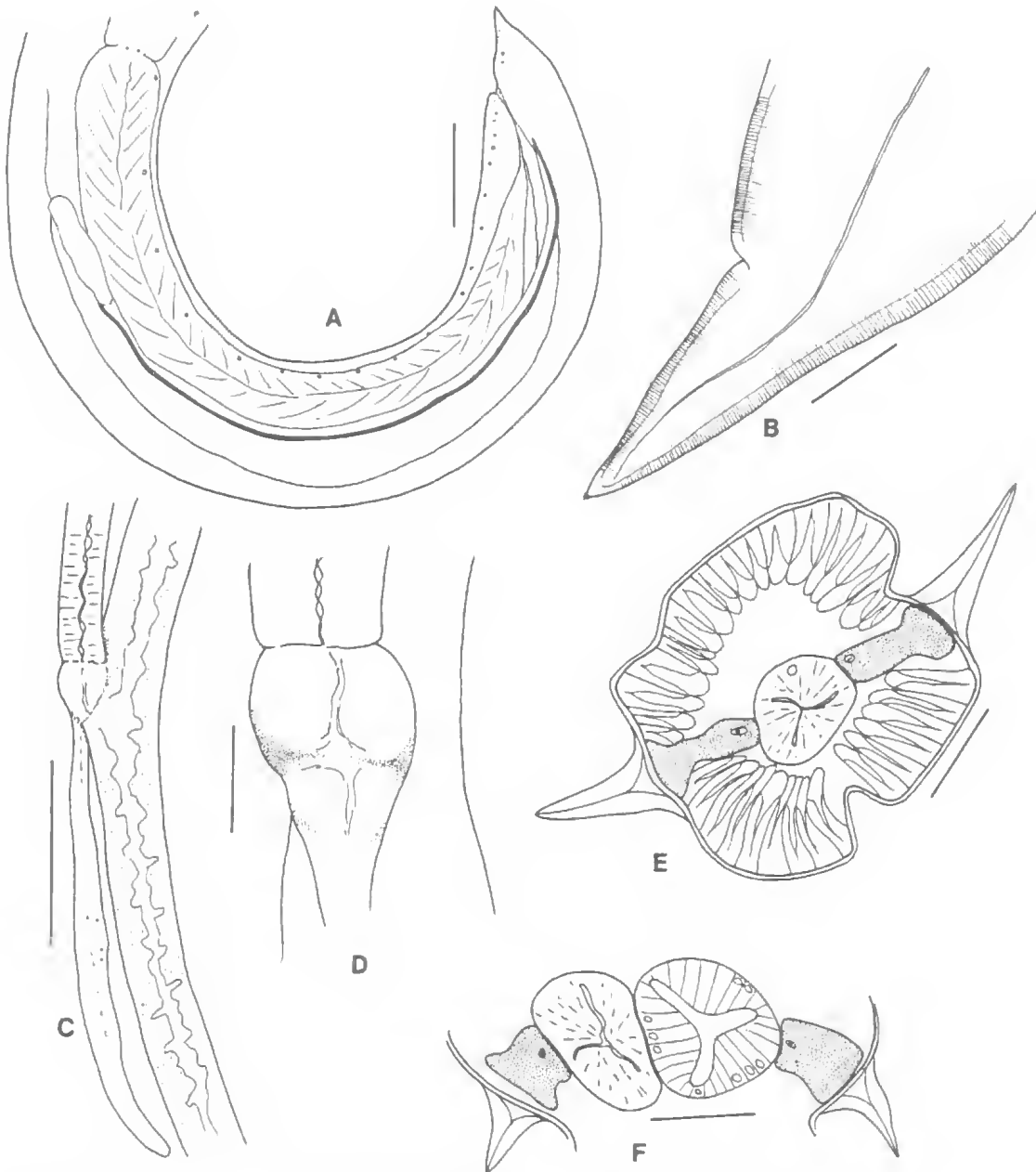
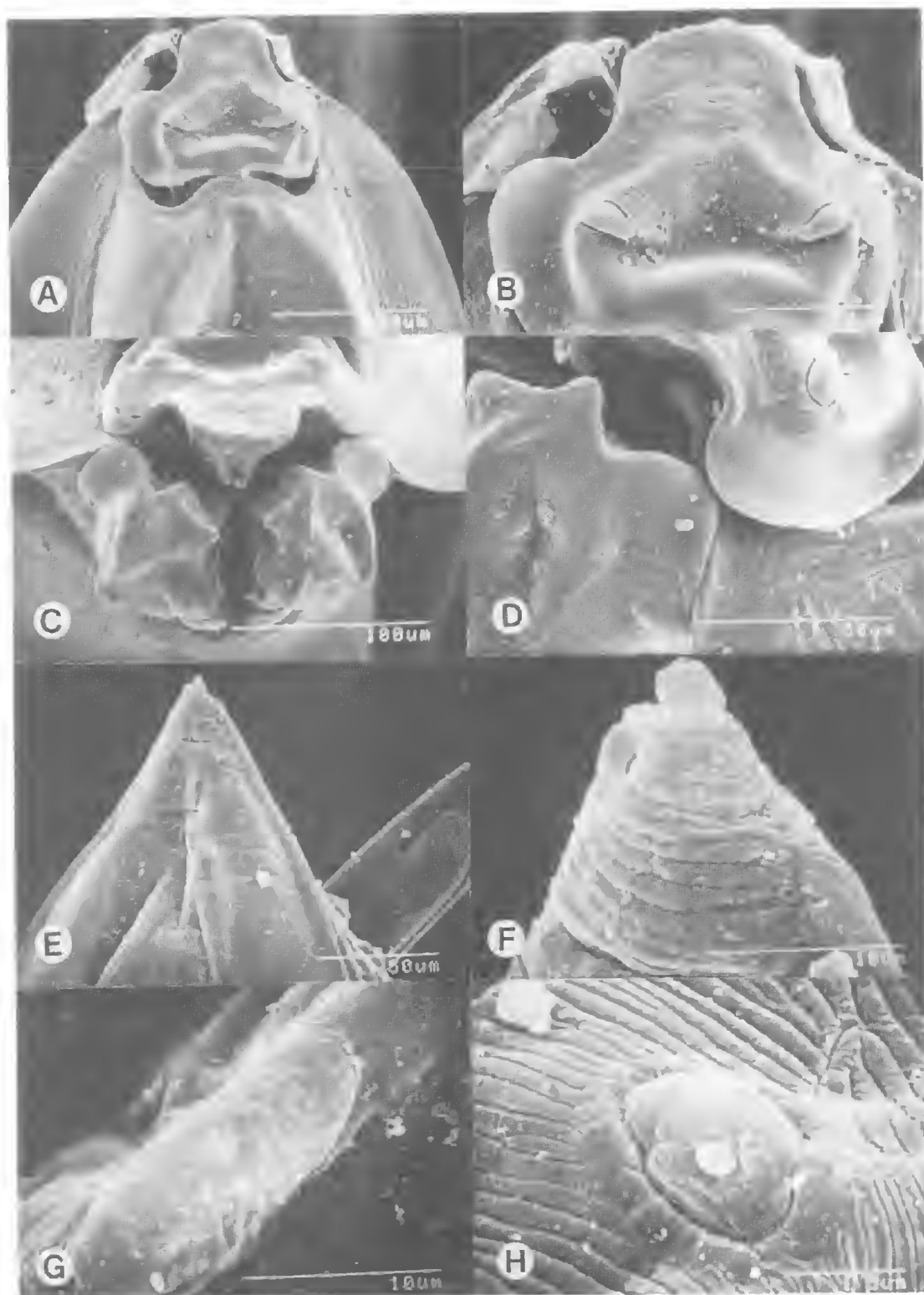


FIG. 14. *Hysterothylacium zenis*. A, caudal region, ♂ #3 (scale 200 μ m); B, tail, ♀ #1 (100 μ m); C, ventricular area, ♂ #1 (0.5 mm); D, ventriculus, ♀ #2 (100 μ m); Sections: E, posterior to nerve ring (100 μ m); F, mid oesophagus (100 μ m).

oesophagus. Excretory system initially posteriorly bilateral with right canal terminating anterior to ventriculus, left canal persisting beyond ventriculus; pore opening immediately posterior to nerve ring (one specimen observed).

Male. Body 21.5-32.5 mm long, 329 maximum width; width at oesophageo-intestinal junction 251-517; ratio of greatest width to length 1: 44.3-65.4 (mean = 1: 56.12). Dorsal lip 113-122 long, 146-169 wide (two specimens); subventral lip 103



long by 115 wide (one specimen). Oesophagus 4606-5076 long, 160-188 wide. Ventriculus 116-166 long by 141-188 wide; ventricular appendix 1269-1316 long, 75-94 wide, 25.00-26.17% (2 specimens) oesophageal length. Intestinal caecum 3008-3572 long, 188-216 wide; 62.0-71.0% (mean = 66.1%) oesophageal length. Ejaculatory duct 5.70-8.74% BL (mean = 7.52%). Spicules 1222-2115 long; 65.0-87.6% ED (mean = 76.21%). Caudal papillae pairs 24-32, changing from button to mamillate at about 7th anterior to cloaca. Tail 150-188 long.

Female. Body 41.8-43.6 mm long, 743-846 maximum width; width at oesophago-intestinal junction 470-536; ratio of greatest width to length 49.4-57.9. Dorsal lip 132 long by 165 wide; subventral lip 141 long by 160 wide. Nerve ring 494-517 from anterior. Excretory pore not sighted. Oesophagus 5075-5452 long by 141-207 wide. Ventriculus 136-165 long by 141-207 wide; ventricular appendix 1410-1739 long by 66-94 wide; 25.9-34.3% oesophageal length. Intestinal caecum 3572-3854 long by 141-255 wide; 70.4-70.7% oesophageal length. Vulva opening 21.34-21.76 mm or 49.6-52.1% BL from anterior extremity, vulva area not swollen. Vagina 1974-3729 long; uterus divides 4068 from vulva. Eggs 56-85 in diameter. Tail 282-320 long, apex with small, minutely nodulose nipple like process.

Variation. One male had two double papillae on the right side of the tail, all others had only one. The lower figures given for the precloacal papillae may be too low as most specimens were tightly coiled and papillae obscured from view. The lengths for the vagina given for two females of similar body lengths appears disparate. Examination of further specimens is necessary to place more confidence on the range given.

HOSTS

Recorded only from the Family Zeidae. Present material is from *Zenopsis nebulosus* (Temminck and Schlegel). Previous records are from *Zeus capensis* Valenciennes (type host, Baylis, 1929), and *Zenopsis nebulosus* from Japan (Yamaguti, 1941, 1961b).

DISTRIBUTION

Japan (Yamaguti, 1941), South Africa (Baylis,

1929), and now eastern Australia. The unpublished record of Brunsdon (1956) is not of this species.

REMARKS

Comparison of the present material to the syntypes of Baylis (1929) reveal no points of contradiction. The shape of the dorsal lip in both cases corresponds exactly. There are two other inadequately characterised species of *Hysterothylacium* that have been recorded only from zeids, *Hysterothylacium baylisi* (Yamaguti, 1941) can be separated by having only two postcloacal papillae pairs, fewer precloacal papillae, longer spicules (potentially 9.8-13.8% BL) and the vulva positioned at the anterior one third of the body. *Hysterothylacium zenopsis* (Yamaguti, 1941), the second species, is here placed in synonymy with *H. zenis*. Yamaguti's (1941) description agrees in most respects (papillae pairs, spicules, position of vulva, tail apex, ventricular appendage and intestinal caecum proportions), but does not have good lip details, and does not mention alae. Yamaguti routinely neglected to mention alae in his descriptions, and while I have not been able to obtain his material, lack of mention in Yamaguti's description cannot be taken to indicate absence.

Several other congeneric species have also been recorded from zeids. These are *Hysterothylacium aduncum* (Rudolphi), *H. clavatum* (Rudolphi) and *H. fabri* (Rudolphi). All of these species lack the long expanded alae and massive subventral interlabia which characterise *H. zenis*, and all have prominently nodulose tail apices.

Brunsdon (1956 unpublished) recorded this species from *Zenopsis nebulosus* in New Zealand waters. This record is a misidentification and differs in several respects, most notably in the proportions of the intestinal caecum and ventricular appendage (about equal, versus ventricular appendage 25-40% caecal length) and in lacking prominent alae.

Ichthyascaris Wu, 1949

Ichthyascaris Wu, 1949: 53.

DIAGNOSIS

Male. Body elongate, reaching greatest width

FIG. 15. *Hysterothylacium zenis*. Scanning electron micrographs. A, anterior; B, dorsal lip; C, cn face; D, lateral interlabium; E, tail, lateral view; F, tail apex; G, precloacal papilla #10; H, postcloacal double papilla.

at about anterior one third of body length. Cuticle finely annulated. Alae run entire length of body, anteriorly united forming flange running posterior to subventral lips; forming cordons on tail. Lips with rounded lateral margins, posteriorly not defined; not pedunculate, without teeth and not laterally constricted; anterolateral angles each with deep socket; pulp anteriorly bilobed. Dorsal lip with 2 lateral double papillae; subventral lips with lateral double papilla and anterolateral papilla with adjacent amphid. Interlabia entirely absent. Ventriculus shorter than wide, with triradiate lumen; ventriculus in line with oesophagus. Ventricular appendage originates from middle of ventriculus, short (24.6–41.3% oesophageal length for the species described herein), sac like, with longitudinal septum. Intestinal caecum absent. Excretory system unilateral, filamentar, with excretory nucleus immediately posterior to excretory commissure; excretory pore opens posterior to nerve ring. Gubernaculum absent. Spicules short (2.2–2.9% BL), alate. Medioventral precloacal papilla present. Tail narrows evenly, apex recurved and provided with fine nodules.

Female reproductive system. Vulva at about anterior one quarter to one third of body. Vagina not distinctly demarcated from uterus. Uterus didelphic, opisthodidelphic, oviducts extending anteriorly to, but not beyond vagina.

TYPE SPECIES

Ichthyascaris lophii Wu, 1949, by monotypy. Wu (1949) did not state where the material he examined was held or to be deposited.

COMPOSITION

Ichthyascaris biwakoensis (Fujita, 1928) n. comb., *I. chirocentri* (Yamaguti, 1935) n. comb., *I. fisheri* (Hoopet, 1983) n. comb., *I. gymnocraniae* n. sp., *I. lutjani* (Olsen, 1952) n. comb., *I. mediterraneus* (Lèbre and Petter, 1983) n. comb., *I. sillagoides* n. sp., and *I. vicentii* (Santos, 1970) n. comb. All except *I. biwakoensis* are from marine hosts.

REMARKS

The genus *Ichthyascaris* Wu, 1949, has received little attention since its inception. The major compilations of Mozgovoi (1953), and later Yamaguti (1961b) did not include the genus. Hartwich (1957) placed the genus in synonymy with *Raphidascaris*, remarking that the two characters Wu (1949) used to distinguish the genus were probably artefacts. Chabaud (1965) fol-

lowed Hartwich (1957), but Hartwich (1975) later did not include *Ichthyascaris* in the synonymy for *Raphidascaris*. Although the genus has been overlooked it is distinctive, and differs from *Raphidascaris* in detail of the lip morphology, a character not considered by Hartwich (1957). Removal of the misplaced species from *Raphidascaris* to *Ichthyascaris* will allow for a clearer concept of both genera.

This genus is readily characterised by the simple lips, as long as wide, with rounded lateral margins. This is in great contrast to the lip morphology shown by the genera *Hysterothylacium*, *Raphidascaroides* and *Raphidascaris*, all of which have flanged lips with a clearly defined posterior border. The lack of an intestinal caecum, short ventriculus, short sac like ventricular appendage, caudal cordons and anterior alal form all serve to further distinguish this genus. Wu (1949) established the genus *Ichthyascaris* with a brief illustrated diagnosis. Nonetheless, several critical diagnostic characters are figured or mentioned. These are: 1, the ventriculus and ventricular appendage; 2, lack of interlabia; 3, alae uniting forming a ventral flange; 4, lack of intestinal caecum; and 5, lips without flanges. While there is little doubt that the genus is valid and clearly distinct from *Raphidascaris* (with which it had been synonymised by Hartwich, 1957), the description of the type species is insufficient in detail to allow recognition or clear separation from other species now being placed in *Ichthyascaris*.

The anterior alal morphology, with the alae uniting close the subventral lips is a character unique to this genus. It is primarily on the basis of this character that *Ichthyascaris chirocentri* is transferred from *Raphidascaris*.

Additional species of *Ichthyascaris* for which there was insufficient material for description were obtained from *Macquaria colonorum* (Günther), *Solea* sp., and *Atherinomorus ogilbyi* (Whitley). These worm specimens are held in the collections of the Queensland Museum.

RELATIONSHIPS

The genus most similar to *Ichthyascaris* is *Paraheterotyphlum* Johnston and Mawson, 1948 (see Sprent, 1978b for a detailed description). It differs from *Ichthyascaris* in possessing an intestinal caecum, lacking the distinct united anterior alae and lacking caudal cordons. Both genera share the characteristic lip shape, lack of interlabia and ventricular morphology. *Heterotyphlum* Spaul, 1927 (and see Deardorff and

Overstreet, 1981) is also very similar, but has lips that are much shorter, lacking the characteristic rectangular shape of *Ichthyascaris* or *Paraheterotyphlum*.

The previously named species now assigned to *Ichthyascaris* had all (except *Raphidascaroides fisheri*) been placed in the genus *Raphidascaris* Railliet and Henry, 1915. Smith (1984) gave an excellent redescription of *Raphidascaris acus* (Bloch) the type species for the genus. In comparing the lip morphology of *R. acus* to that of the species now transferred to *Ichthyascaris* it is evident that the species in question are generically incompatible. This is further supported by differences in alar morphology, excretory system and caudal cordons.

There are several other genera that show an affinity to *Ichthyascaris*. Most of these genera would have been placed in the Heterocheilinae (sensu Sprent, 1983) or the Goeciinae (sensu Gibson, 1983). Within these groups they appear to form a group apart from the other genera, characterised by the unique morphology of the ventriculus and ventricular appendage. The ventriculus of these genera is about as wide as the preceding oesophagus and in line with the oesophagus. In those genera for which there are appropriate figures, the ventriculus still maintains the triradiate symmetry of the oesophagus. The ventricular appendage originates from the middle of the ventriculus, in contrast to that of *Hysterothylacium* where the bulb like ventriculus gradually narrows to form the posterior ventricular appendage. The genera forming this group are *Raphidascaris*, *Heterotyphlum*, *Paraheterotyphlum*, *Ichthyascaris*, *Sprentascaris* Petter and Cassone, 1984 and probably also *Alibagascaris* Kalyankar, 1970.

None of these genera have interlabia or teeth with dentigerous ridges. *Sprentascaris* and *Raphidascaris* have flanged lips. It is unclear from Yamaguti's diagnoses (1935, 1961b), or the species contained within the genus, quite where *Raphidascaroides* should be placed.

Most of the genera mentioned above have not been rediagnosed since their inception. In order to facilitate their clear discrimination from *Ichthyascaris* it is necessary to attempt a redefinition that allows comparison to that given for *Ichthyascaris*. To this end the genera *Raphidascaris*, *Raphidascaroides*, *Heterotyphlum* and *Paraheterotyphlum* are rediagnosed with remarks at the end of the text.

Ichthyascaris fisheri (Hooper) n. comb.

Raphidascaroides fisheri Hooper, 1983: 8, Fig. 4.

MATERIAL EXAMINED

Holotype (AM W15713) and allotype (AM W16039).

REMARKS

Examination of the type material showed that discrepancies exist between the material and the figures and description given by Hooper (1983). Hooper (1983) described the species as 'with interlabia $\frac{1}{3}$ the length of lips' and 'Lips with dentigerous ridges'. The figures show distinct interlabia, and also what appear to be narrow lateral flanges on the lips. These character states are not present in the holotype and allotype. The lips are simple, without flanges, dentigerous ridges or interlabia, and conform entirely to the diagnosis given here for *Ichthyascaris*. The tail is typical of the shape shown by the genus with the apex turned up and with the alae forming cordons. The alae are united anteriorly forming a flange just posterior to the subventral lips. Accordingly the species is here transferred to *Ichthyascaris*.

Ichthyascaris fisheri, recorded only from flathead (Platycephalidae), is easily separated from other Australian species of the genus by the lateral margins of the lips having a small bulge posterior to the anterolateral sockets and by the very short intestinal caecum.

Ichthyascaris gymnocraniae n. sp. (Figs 16, 17)

MATERIAL EXAMINED

All taken from the northwestern side of Wistari Reef, Capricorn Group, Queensland, coll. N.L. Bruce and S. Cook, 2 males, 1 female, 21 Apr. 1988, intestine of *Gymnocranius bitorquatus* (HOLOTYPE male, QM GL10260, PARATYPES QM GL10261). Female, 22 Apr. 1988, intestine of *G. bitorquatus* (PARATYPE QM GL10262). Female, 21 Apr. 1988, intestine of *Iethrinus chrysostomus* (sectioned, QM GL10263).

TYPE LOCALITY

Wistari Reef, Capricorn Group, Queensland, 23°26.5'S, 151°54.0'E.

TYPE HOST

Gymnocranius bitorquatus Cockerell, I. ethrinidae.

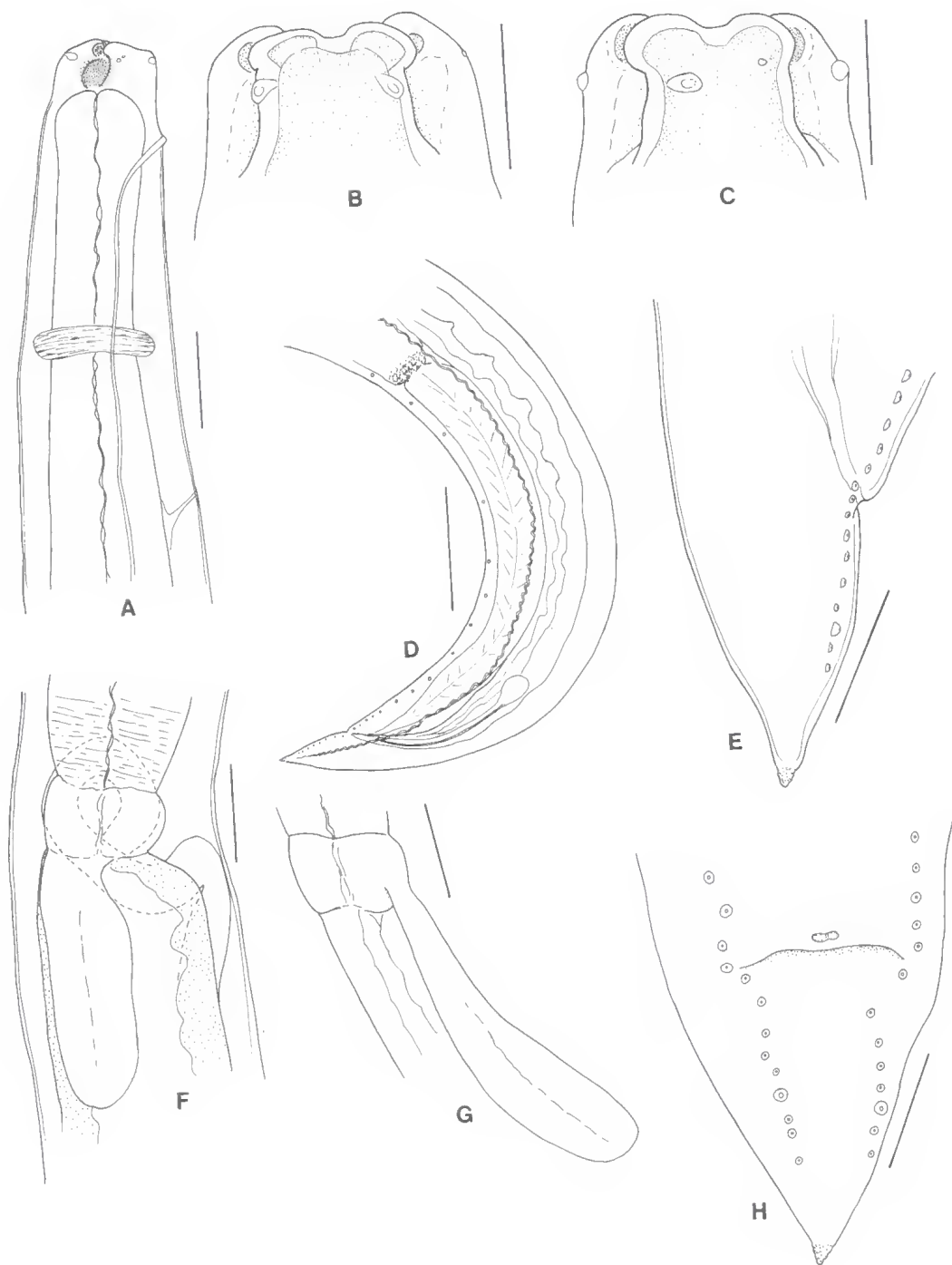


FIG. 16. *Ichthyascaris gymnocraniae* n. sp. Figs. of holotype except where indicated. A, anterior (scale 100 μm); B, dorsal lip δ #1 (50 μm); C, subventral lip, δ #1 (50 μm); D, caudal region (200 μm); E, tail, lateral view (100 μm); F, ventricular region. δ #1 (100 μm); G, ventriculus and appendix (100 μm); H, tail, ventral view, δ #1 (50 μm).

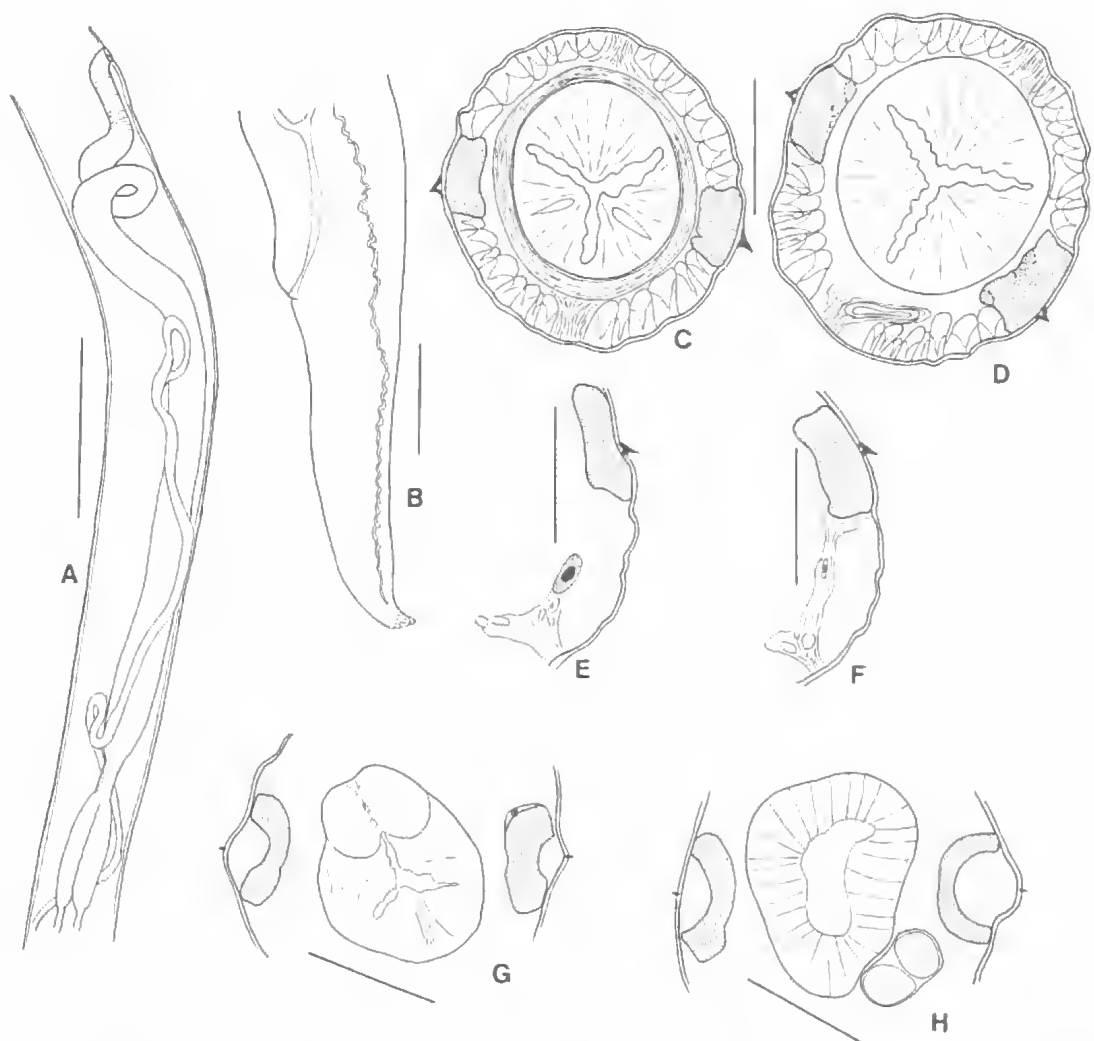


FIG. 17. *Ichthyascaris gymnocraniae* n. sp. A, vagina and uteri, ♀ #1 (scale 200 μ m); B, tail, lateral view, ♀ #1 (100 μ m); Sections (scales all 100 μ m): C, nerve ring; D, excretory duct; E, excretory nucleus; F, posterior to excretory nucleus; G, ventriculus; H, mid ventricular appendix.

DIAGNOSIS

Cuticle finely annulated. Lips as long as, or slightly longer than wide, widest anteriorly. Alae run entire length of body. Caudal papillae pairs: precloacal 24-28; paracloacal 2; postcloacal 7-9, 3rd or 4th from posterior larger than adjacent papillae. Weakly developed medioventral precloacal organ present. Spicules subequal in length, ratio of 1: 1.07-1.08, 2.19-2.91% BL. Tail converging evenly to minutely nodulose apex.

DESCRIPTION

Based on 2 mature males and 2 mature females.

General. Body reaching greatest width at anterior one third to one half of length, of moderately even width. Dorsal lip slightly wider than subventrals. Oesophagus 7.69-9.32% BL. Ventriculus narrower than greatest width of oesophagus, about one half to one third as long as wide (0.45-0.66). Ventricular appendix 24.59-41.27% length of oesophagus. Nerve ring lying

between anterior 25.2-29.9% of oesophagus. Excretory system with pore opening distinctly posterior to nerve ring.

Male. Body 11.3-15.0 mm long by 188-291 maximum width; width at oesophageo-intestinal junction 118-249, ratio of greatest width to length 1: 51.6-60.1. Dorsal lip 61-70 long, 66 wide; subventral lips 66-67 long, 56-67 wide. Nerve ring 241-249 from anterior. Excretory pore 353-494 from anterior. Oesophagus widest at posterior one third, 1053-1194 long by 122-160 wide. Ventriculus 80-85 long, 127-150 wide; ventricular appendix 259-385 long, 71 wide, 24.59-32.25% oesophageal length. Ejaculatory duct 799-1175 long, 5.33-10.4% BL. Spicules 306-353 long, 26.04-44.18% ED (mean = 34.85%). Caudal papillae pairs 33-38, changing from button to mamillate at 9th anterior to cloaca. Tail 127-160 long, apex minutely nodulose.

Female. Body 11.6-18.0 mm long by 226-409 maximum width; width at oesophageo-intestinal junction 179-306; ratio of greatest width to length 1: 44.0-51.3. Dorsal lip not measured; subventral lips 56-80 long, 56-80 wide. Nerve ring 249-320 from anterior. Excretory pore 353-470 from anterior. Oesophagus 865-1222 long by 132-216 wide. Ventriculus 71-85 long by 108-188 wide. Ventricular appendix 306-357 long by 75 wide. Vulva opening 2.12-3.57 mm or 18.23-19.84% BL from anterior extremity; vulva area not swollen. Vagina 235-893 long, uterus divides 1834-2538 from vulva, divided branches short, 271-423 long. Oviducts not extending anterior to vulva. Eggs 38-47 in diameter. Tail 390-423 long, apex minutely nodulose.

Variation. The most notable variation is that of the absolute and relative lengths of the ventricular appendage ranging from 24.5%-41.3% oesophageal length.

HOSTS

Presently recorded only from the family Lethrinidae: *Gymnocranius bitorquatus* and *Lethrinus chrysostomus* Richardson.

DISTRIBUTION

At present known only from the type locality.

REMARKS

This species is readily separated from most others of the genus by the lips being abruptly wider anteriorly. *Ichthyascaris lutjani* has similar lips, but has a slender ventricular appendage, is much larger in size, has fewer

precloacal papillae (9-11 pairs vs 24-28 pairs) and fewer postcloacal papillae (3 pairs vs 7-9 pairs). The remaining species have the lips illustrated as anteriorly rounded, except that the shape of the lips is not known for *I. chirocentri* (Yamaguti). In *I. chirocentri* the number of papillae (60) clearly separates it from *I. gymnocraniae* (33-38).

For details on how to distinguish *L. gymnocraniae* from *L. sillagoides* see the 'Remarks' for the latter species.

ETYMOLOGY

The epithet is taken from the genus name of the type host.

Ichthyascaris sillagoides n. sp. (Figs 18-20)

MATERIAL EXAMINED

All from *Sillago maculata*, Moreton Bay, southeastern Queensland, coll. G. Berry. Male, HOLOTYPE, 17 Feb. 1981, Deception Bay (QM GL9260). PARATYPES: Female (sectioned), 17 June 1978, Deception Bay (QM GL18776); male, 29 Aug. 1982, (QM GL 9448); 2 females (one for SEM), 23 Apr. 1978, Deception Bay (QM GL8768); female, 23 Apr. 1978, Deception Bay (QM GL8769); female, 17 Jun. 1978, Deception Bay (QM GL9106); female, 29 Aug. 1982, (QM GL9447); female, 29 Aug. 1982, (QM GL9450); female, 29 Aug. 1982, (QM GL9451). Two immature specimens (QM GL9449, AHC 18814).

TYPE LOCALITY

Deception Bay, Moreton Bay, southeastern Queensland.

TYPE HOST

Sillago maculata Quoy and Gaimard, Sillaganidae.

DIAGNOSIS

Cuticle distinctly annulated. Lips with length to width ratio of 1.07-1.18, widest anteriorly. Caudal papillae pairs: precloacal 22-26; paracloacal 1; postcloacal 8-10; medioventral precloacal papilla not discerned; no double papillae. Spicules of approximately equal length, ratio of 1: 1.09; 2.27-2.47% BL. Tail with recurved minutely nodulose apex.

DESCRIPTION

Based on 2 males and 5 females.

General. Body of fairly even thickness. Dorsal lip slightly larger than subventrals; widest at

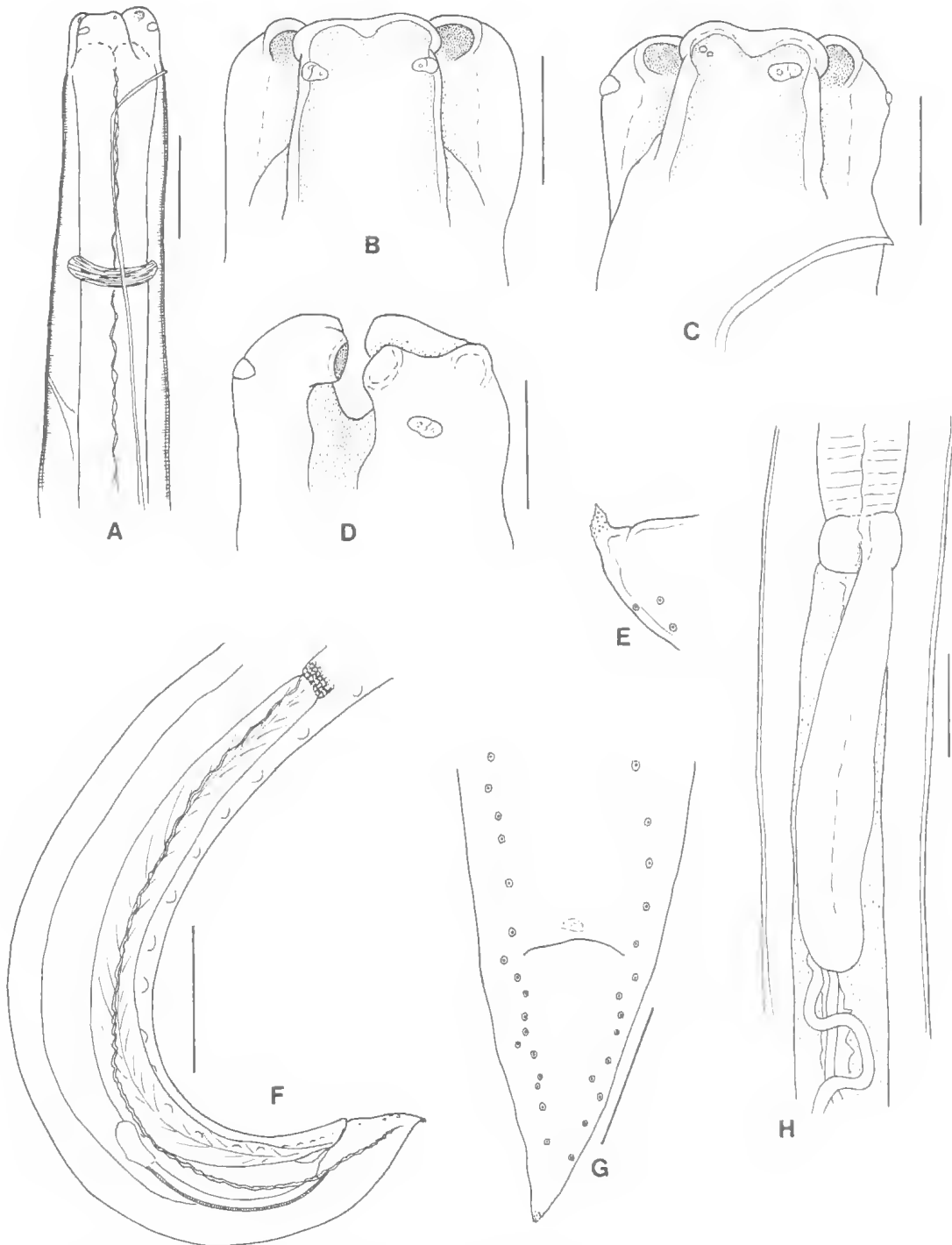


FIG. 18. *Ichthyascaris sillagoides* n. sp. Figs of holotype except where indicated. A, anterior (scale 100 μ m); B, dorsal lip, ♀ #21 (50 μ m); C, subventral lip, ♀ #2 (50 μ m); D, between lips, ♀ #2 (50 μ m); E, tail apex; F, caudal region (200 μ m); G, tail, ventral view, ♂ #2 (50 μ m); H, ventricular area (100 μ m).



FIG. 19. *Ichthyascaris sillagoides* n. sp. A, tail, lateral view, holotype (scale 50 μ m); B, tail, lateral view, ♀ #1 (100 μ m); C, tail, lateral view, ♀ #3 (100 μ m); D, tail apex, ♀ #1; E, tail apex, ♀ #2; F, vagina and uterus, ♀ #1 (0.5 mm).

anterior margin. Oesophagus 5.91-8.16% BL. Ventriculus slightly narrower than widest level of oesophagus, shorter than long. Ventricular appendix 27.59-38.60% length of oesophagus. Nerve ring lying between anterior 24.83- 31.70% of oesophagus. Excretory system with pore opening distinctly posterior to nerve ring.

Male. Body 9.5-14.2 mm long, 188-212 maximum width; width at oesophageo-intestinal junction 155-165; ratio of greatest width to length 1: 51.0-67.0. Dorsal lip not measured. Subventral lips 47-71 long by 42-71 wide. Nerve ring 230-282 from anterior. Excretory pore 352-376 from anterior. Oesophagus 729-1128 long by 94-113 wide. Ventriculus 52-61 long by 85-94 wide; ventricular appendix 282-447 long by 42-80 wide. Testes extend anteriorly to vicinity of ventricular appendix. Ejaculatory duct 8.82-12.89% BL. Caudal papillae pairs 31-37, changing from button to mamillate at about 8th anterior to cloaca. Spicules 282-306 long 17.7-19.1% ED

(one specimen). Tail 103-118 long, apex recurved.

Female. Body 13.6-30.2 mm long, 216-498 maximum width; width at oesophageo-intestinal junction 179-320; ratio of greatest width to length 1: 48.4-67.8 (mean = 1: 59.7). Dorsal lip 94 long by 80 wide (one specimen); subventral lips 66-108 long by 66-94 wide. Nerve ring 291-470 from anterior. Excretory pore 611-423 from anterior (3 specimens). Oesophagus 1109-1833 long by 80-188 wide. Ventriculus 66-103 long by 80-174 wide; ventricular appendix 306-611 long by 66-118 wide. Vulva opening 3.50-9.34 mm or 22.8- 29.0% BL from anterior extremity, vulva area not swollen, ovaries extending to vicinity of vulva. Vagina short 329-517, not abruptly differentiated from uterus. Uterus divides 1192-2350 posterior to vagina, branches 658-1880 long (2 specimens). Eggs 19-47 in diameter. Tail 301-479 long, posteriorly recurved, apex minutely nodulose.

Variation. The two largest female specimens had noticeably thicker tails, while the degree of nodule development on the tail apex also varied. Lip shape varied with regard to degree of indentation of the anterior margin (e.g. comparing Fig. 18B to Fig. 18C) but this may be attributable to angle of observation.

HOSTS

Known only from the type host.

DISTRIBUTION

Known only from localities in Moreton Bay, southeastern Queensland.

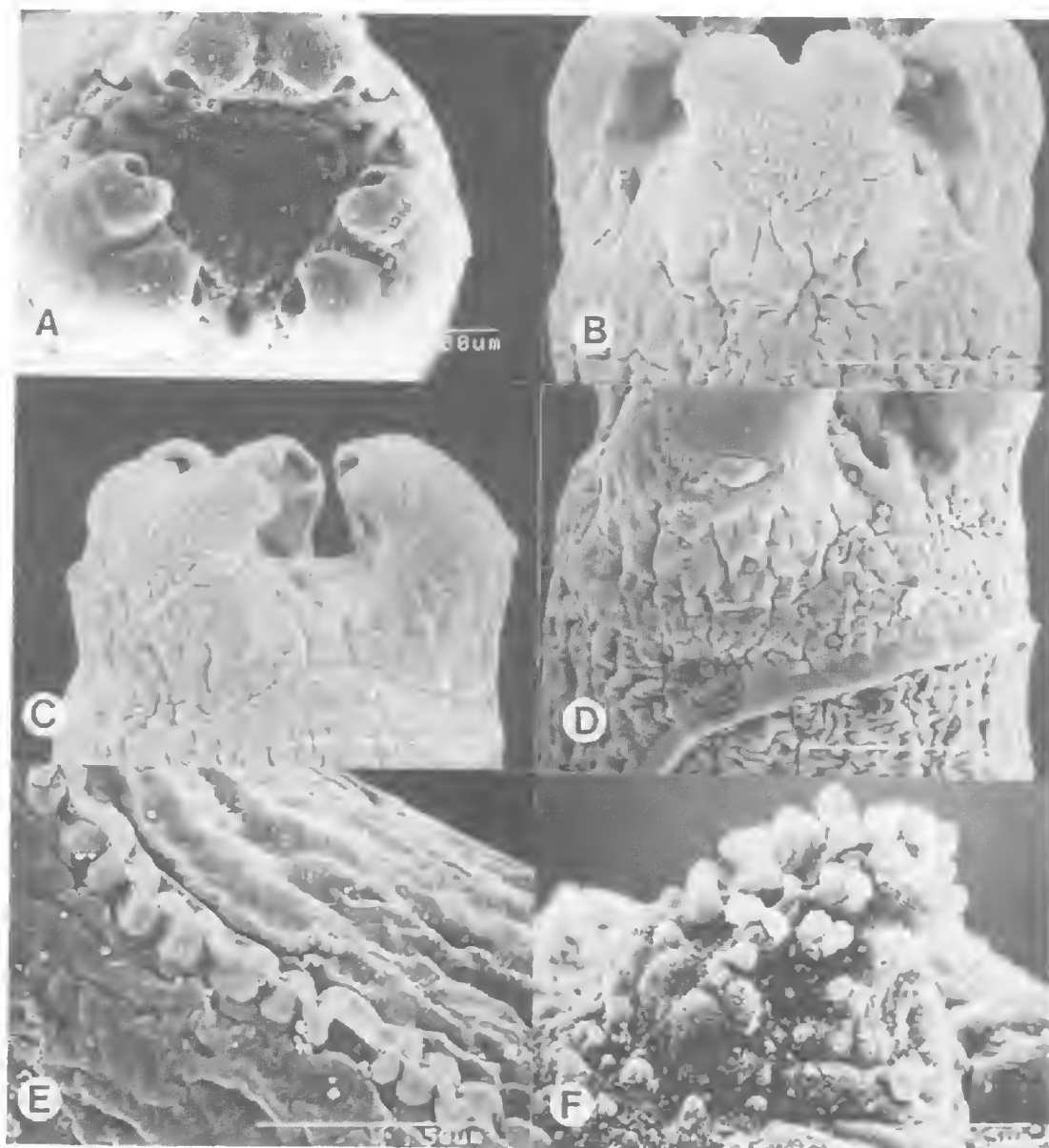


FIG. 20. *Ichthyascaris sillagoides* n. sp. Scanning electron micrographs. A, en face; B, dorsal lip; C, between lips; D, subventral ala; E, caudal cordon; F, cactus.

REMARKS

Ichthyascaris gymnocraniae and *I. sillagoides* are superficially very similar. There are however numerous differences, especially sexual characters, and these are sufficient to consider the two species as distinct. These differences are in *I. sillagoides*: spicules 17.7-19.1% ED (vs 26.1-44.2% ED in *I. gymnocraniae*); ejaculatory duct 8.8-12.9% BL (vs 5.3-10.4% BL); precloacal papillae 22-26 pairs (vs 24-28 pairs); vulva 22.8-29.0% BL from anterior (vs 18.2-19.0% BL); and uterine branches long, 658-1180 (vs short 270-423).

Ichthyascaris sillagoides can be distinguished from other species by the lesser number of precloacal papillae, except for *L. vicentei* and *L. mediterraneus* from which it differs by having more postcloacal papillae.

Khan and Yaseen (1969) described a worm from *Sillaginopsis panijus* using the combination *Raphidascaaris panijii* Khan and Yaseen. Smith (1984) considered this species as *species inquirenda*. While the description is not detailed, and the species cannot be reliably assigned to any genus, the very long ventricular appendage suggests that it is not conspecific with the material from *Sillago maculata* described here.

ETYMOLOGY

The epithet is derived from that of the host genus.

REDIAGNOSED GENERA

In order to enable comparisons to be made between *Ichthyascaris* and related genera it is necessary to rediagnose the following genera in as much detail as possible. Without recourse to fresh material, type material, or in some cases a good description, the information contained within these diagnoses is inevitably uneven in detail. Nonetheless these diagnoses are here attempted to allow the clear separation of *Ichthyascaris* from related genera. A second purpose is to draw attention to these genera and highlight the need for additional descriptive data. In this regard it is *Raphidascaaroides* that is most deficient in detail, and will remain so until the types or fresh specimens of the type species are redescribed.

Heterotyphlum Spaul

Heterotyphlum Spaul, 1927: 634.- Mozgovoi, 1953; Hariwich, 1957: 238; Yamaguti, 1961b: 31; Deardorff and Overstreet, 1981: 431.

DIAGNOSIS

Body elongate, anterior half manifestly narrower than posterior half; cuticle finely annulated, male with fine crests anterior to cloaca. Alae narrow, originate close to subventral lips, run entire length of body. Lips about half as long as wide, anterior rounded, without anterolateral sockets or dentigerous ridges; without lateral flanges and constrictions, posteriorly not defined. Interlabia entirely absent. Dorsal lip with two lateral double papillae; subventral lips with one double papilla and anterolateral single papilla with adjacent amphid. Ventriculus shorter than wide, in line with oesophagus. Ventricular appendage long (c. 62-72% length of oesophagus) anterior half slender, posterior half expanded, sac like. Intestinal caecum present. Excretory pore opens near to nerve ring (excretory system otherwise not described). Gubernaculum absent. Spicules short (c. 2.2% BL), alate. Tail broadly rounded, with simple mucron.

Female reproductive system. Vulva situated in anterior half of body (38% BL from anterior), didelphic, opisthodidelphic. Oviducts not extending anteriorly to vagina.

TYPE SPECIES

Heterotyphlum himantolophi Spaul, 1927, by monotypy [BM(NH) 1927.7.22 31-38].

REMARKS

The type species of this genus is still known only from the original material. Of the other species placed in the genus only one has been adequately described and that species has been placed in *Hysterothylacium* by Deardorff and Overstreet (1981). As indicated by Deardorff and Overstreet (1981) the remaining species are in need of redescription before their generic position can be accurately determined.

The morphology of the ventriculus and lips indicates that *Heterotyphlum* is most closely related to *Paraheterotyphlum* and *Ichthyascaris*. *Ichthyascaris* can be distinguished by the longer lips and lack of an intestinal caecum. *Paraheterotyphlum* by having long rectangular lips and a body of even width.

The syntypes of *H. himantolophi* were examined for purposes of the generic diagnosis, and it was noticed that the male tail is provided with fine transverse crests anterior to the cloaca. These are not prominent as in the species of *Maricostula* figured by Bruce and Cannon (1989).

Species placed in the genus (Yamaguti 1961b), all of which should be regarded as *species inquirendae* and *incertae sedis* are: *H. cheni* Hsu, 1957; *H. multipapillosum* (Skrjabin, 1916); and *H. obtusicaudatum* (Zeder, 1800).

Paraheterotyphlum Johnston and Mawson

Paraheterotyphlum Johnston and Mawson, 1948: 102.- Hartwich, 1957: 242; Yamaguti, 1961b: 169; Schmidt and Kunz, 1973: 483; Sprent, 1978b: 164.

DIAGNOSIS

Body elongate, of even thickness. Cuticular annules not evident. Alae not cervically expanded; run entire length of body, originating posterior to subventral lips. Lips longer than wide, rectangular, not pedunculate, posteriorly not defined; without dentigerous ridges and lateral flanges, not laterally constricted; anterolateral corner each with socket. Dorsal lip with 2 lateral double papillae; subventral lips each with double papilla and mediolateral single papilla and adjacent amphid. Interlabia entirely absent. Ventriculus shorter than wide, with triradiate lumen; in line with oesophagus. Ventricular appendage long (35-58% oesophageal length). Intestinal caecum present. Excretory system filamentar, unilateral, nucleus near nerve ring; excretory pore opening immediately posterior to nerve ring. Gubernaculum absent. Spicules short (c. 2% BL), alate. Tail straight, narrowly rounded, apex minutely nodulose.

Female reproductive system. Vulva in anterior one third of body, didelphic, opisthodidelphic; oviducts not extending anterior to vagina.

TYPE SPECIES

Paraheterotyphlum australe Johnston and Mawson, 1948, by monotypy.

REMARKS

The genus and its constituent species have been discussed in detail by Sprent (1978b). The most closely allied genus is *Ichthyascaris* which has a near identical lip morphology. *Paraheterotyphlum* differs in having shallower lip sockets and an intestinal caecum. A further difference is that the two species of *Paraheterotyphlum* are far larger (61-158 mm) than most *Ichthyascaris* (up to 30 mm) although size is not regarded as a character of generic significance. However *I. lutjani* is recorded 32-72 mm which overlaps with that for

Paraheterotyphlum. *Heterotyphlum* is distinguished by its very much shorter lips. Two species from sea snakes are known, the type species and *P. ophiophagos* Schmidt and Kunz, 1973.

Raphidascaris Railliet and Henry

Raphidascaris Railliet and Henry, 1915.- Mozgovoi, 1953: 402; Hartwich, 1957: 237; 1974: 9; 1975: 101; Yamaguti, 1961b: 35; Yorke and Maplestone, 1926: 274; Chabaud, 1965: 904. *Neogoezia* Kreis, 1937: 129.

DIAGNOSIS

Male (from Smith, 1984). Body elongate, finely annulated. Alae originate from between bases of subventral lips and run to middle of tail; cervically expanded, without caudal cordons. Lips with lateral flanges, medially constricted; with postlabial grooves; pulp anteriorly bilobed. Dorsal lip with two lateral double papillae; subventral lips with double papilla and anterolateral papilla with adjacent amphid. Interlabia absent. Ventriculus shorter than long, in line (= cylindrical) with oesophagus. Ventricular appendage with septum. Intestinal caecum absent. Excretory system filamentar, posteriorly bilateral, with reduced right canal. Excretory nucleus distinctly posterior to commissure (Gibson, 1983, fig. 1, C1). Excretory pore opening posterior to nerve ring. Gubernaculum absent. Spicules short, subequal, alate. Precloacal medioventral papilla present. Tail curving ventrally, apex narrowed, unornamented.

Female reproductive system. Vulva opening between anterior one quarter and one third of body. Uterus didelphic, opisthodidelphic; oviducts not extending anterior to vulva.

TYPE SPECIES

Ascaris acus Bloch, 1779, by original designation

REMARKS

Smith (1984) redescribed *Raphidascaris acus* in excellent detail with a full synonymy and also listed the species then placed in the genus. Of a total of 10 species that Smith considered potentially valid, he regarded five as *species inquirendae*. All of the remaining species, for which there were adequate figures, are here transferred to *Ichthyascaris*.

As discussed for *Raphidascaroides* the interpretation of interlabia is of great importance in

discriminating these two genera. Two species of *Raphidascaroidea* (*R. hishaili* and *R. chilomyteri*) differ from *Raphidascaris* only by having distinct (as figured) interlabia. Yet, examining the SEM's of Smith (1984) one sees a rudimentary interlabial knob (cf. Soleim, 1984) or what is formed by united postlabial grooves. Redescription and reassessment of interlabial morphology is necessary before generic reassignment of those species can be undertaken.

At present the type species is the only identifiable species of the genus. Species of doubtful status are listed by Smith 1984.

Raphidascaroidea Yamaguti

Raphidascaroidea Yamaguti, 1941: 355.- 1961b: 36;
Mozgovoi, 1953: 418; Chabaud, 1965: 995;
Hartwich, 1957: 239; 1974: 9.
Ryphkovascaris Mozgovoi, 1950.- 1953: 419.

DIAGNOSIS (adapted and expanded from Yamaguti, 1941, 1961b).

Body elongate, finely annulated. (Alae not described). Lips with lateral flanges, medially constricted, with dentigerous ridges; pulp anteriorly bilobed. Dorsal lip with two lateral double papillae; subventral lips with double papilla and anterolateral single papilla with adjacent amphid. Distinct interlabia present. Ventriculus shorter than long, with ventricular appendage. Intestinal caecum absent. Excretory pore opens posterior to nerve ring (excretory system otherwise undescribed). Gubernaculum absent. Spicules subequal in length, alate. Tail weakly curved ventrally, apex minutely nodulose.

Female reproductive system. Vulva situated about one third of body length from anterior; oviducts not extending anterior to vulva.

TYPE SPECIES

Raphidascaroidea nipponensis Yamaguti, 1941, by original designation.

REMARKS

Yamaguti (1941) established the genus for one species and a subspecies of the nominate type species. Later (Yamaguti, 1961a) he described a second species, not mentioning the presence of dentigerous ridges. When redefining the genus (Yamaguti, 1961b), the diagnosis was modified by adding in a footnote '[dentigerous ridges] Absent occasionally'. Species were slowly added to the genus, and by 1988 eleven species

had been assigned to the genus. Two characters are critical in the discussion of *Raphidascaroidea*: dentigerous ridges on the lips and interlabial morphology. Lip shape is a further character that is of significance.

Of the species currently placed in the genus only those that Yamaguti (1941) originally placed in the genus and *R. fisheri* Hooper, 1983 have been described as having dentigerous ridges. No species have had the dentigerous ridges figured. Examination of the type material of *R. fisheri* failed to reveal dentigerous ridges, and the species has been transferred to *Ichthyascaris* (see the species account and 'Remarks' for that genus). Presence of a dentigerous ridge is a character that is consistent within genera, and it would seem unacceptable to have both states within a single genus. Therefore those species without dentigerous ridges should be reassigned.

Yamaguti's (1941, 1961a, 1961b) descriptions clearly indicate that substantial interlabia were present in the species he examined, describing them as 'conical' (Yamaguti, 1941) and 'nearly half as long as lips' (Yamaguti, 1961a). In at least one species currently placed in the genus, *R. africanus* Khalil and Oyetayo, 1988, the SEMs show that interlabia, in the sense of Yamaguti (1941, 1961a) or as shown by *Hysterothylacium* and *Maricostula*, are absent.

There is a problem here of intergradation of characters and of interpretation. Interlabial morphology has been discussed by Soleim (1984), who reiterated Berland's (1961) distinction between interlabia and semi-interlabia. In the genera here under discussion all interlabia are of the latter category. This interlabial form is not clearly defined, and when reduced causes problems in interpretation. In the genus *Ichthyascaris*, totally lacking postlabial grooves, the lack of interlabia is unambiguous. In species with defined postlabial grooves, the continuation of the groove clearly gives the impression of an interlabium. This is clearly shown by *Hysterothylacium tasmaniense* where the interlabial structure is sessile and in great contrast to the form shown by *Hysterothylacium zenis* (Fig. 13G) or species of *Maricostula* Bruce and Cannon, 1989 (SEM's). While it is pertinent therefore to attempt differentiation between postlabial grooves, sessile interlabia and semi-interlabia, it is immediately obvious that these first two states will intergrade, whereas the free standing ('non-sessile') form is distinct.

Of the species currently placed in *Raphidascaroidea* four are of uncertain status and those are

regarded here as *species inquirendae*: *Raphidascaroides armatusi* Gupta and Srivastava, 1984; *Raphidascaroides blochii* Bilquees and Khanum, 1974; *Raphidascaroides jagganathai* Gupta and Srivastava, 1984; *Raphidascaroides trachinocephalaui* Rajya Lakshmi *et al.*, 1985. No detailed figures have been given for lip shape, and the species descriptions are not in sufficient detail to allow specific determination or generic placement.

Both *Raphidascaroides diadonis* (Thwaite, 1927) and *R. africanus* have a similar lip morphology. That is flanged lips which are posteriorly narrowed (or angled) with a medial constriction, and lip papillae positioned anterior to the constriction. The recently described species *Sprentascaris hypostomi* Petter and Cassone, 1984 has a cephalic morphology entirely similar to that of *R. africanus* and, contrary to generic diagnosis given for the genus (Petter and Cassone, 1984), is clearly figured with rudimentary interlabia (Petter and Cassone, 1984, fig. 6D). While not questioning the validity of *Sprentascaris* it seems probable that the species mentioned above should be placed within a separate genus, defined by their distinctive lip morphology. *Ryjkovascaris* Mozgovoi, currently placed in synonymy with *Raphidascaroides*, is an available name but redescription of the type species *R. diadonis* is necessary before the validity of the genus can be reassessed.

Both *Raphidascaroides chilomycteri* and *R. bishaii* are figured with prominent interlabia, and it is this character alone which separates them from *Raphidascaris*. The labial and interlabial morphology of these two species also needs to be reassessed.

At present the species are retained within their current combinations and other than those species listed in the preceeding as *species inquirendae* the genus consists of: *R. nipponensis*, the type species and *R. nipponensis lophii* Yamaguti 1941. Also within the genus, but here regarded as *incertae sedis* are: *Raphidascaroides bishaii* Khalil, 1961, *Raphidascaroides chilomycteri* Yamaguti, 1961b, *Raphidascaroides africanus* Khalil and Oyetao, 1988 and *Raphidascaroides diadonis* (Thwaite, 1927).

Resolution of the generic concept of *Raphidascaroides*, which at present is very loose, and its constituent species can only come about with a detailed redescription of the type species coupled with re-examination of the type specimens. Unfortunately the types are not avail-

able for loan, and it is not possible to add further to the descriptions of the type species.

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REFERENCES

- BAYLIS, H.A. 1923. Report on a collection of parasitic nematodes, mainly from Egypt. *Parasitology* 15: 1-13.
- 1929. Parasitic Nematoda and Acanthocephala collected in 1925-1927. *Discovery Reports* 1: 541-560.
- BERLAND, B. 1961. Nematodes from some Norwegian marine fishes. *Sarsia* 2: 1-50.
- BEUMER, J.P., ASHBURNER, L.D., BURBURY, M.E., JETTÉ, E. AND LATHAM, D.J. 1982. A checklist of the parasites of fishes from Australia and its adjacent Antarctic Territories. *Commonwealth Institute of Parasitology, Technical Communication* 48: i-viii, 1-99.
- BILOERS, F.M. AND KHANUM, Z. 1974. Marine fish nematodes of Pakistan. V. A new species of the genus *Raphidascaroides* Yamaguti, 1941. *Pakistan Journal of Zoology* 6: 151-155.
- BLOCH, M.E. 1779. Beitrag zur Naturgeschichte der Würmer, welche in anderen Tieren leben. *Beschäftigungen der berlinischen Gesellschaft naturforschender Freunde* 4: 534-561.
- BRUCE, N.I. AND CANNON, L.R.G. 1989. *Hysterothylacium*, *Iheringascaris* and *Maricos-*

- tula* new genus, nematodes (Ascaridoidea) from Australian pelagic marine fishes. *Journal of Natural History* 23: 1397-1441.
- BRUNSDON, R.V. 1956. 'Studies on nematode parasites of New Zealand fishes. Volume I.' (Unpublished Ph.D thesis: University of New Zealand).
- CHABAUD, A.G. 1965. Ordre des Ascaridida. pp. 932-1025. In P.-P. Grassé (ed.), 'Traité de Zoologie', Tome IV, fascicule 3, pp. 732-1497 pp. (Masson et Cie: Paris).
- DEARDORFF, T.L. AND OVERSTREET, R.M. 1980. Taxonomy and biology of North American species of *Goezia* (Nematoda: Anisakidae) from fishes, including three new species. *Proceedings of the Helminthological Society of Washington* 47: 192-217.
1981. Review of *Hysterothylacium* and *Iheringuscaris* (both previously - *Thynnascaris*) (Nematoda: Anisakidae) from the northern Gulf of Mexico. *Proceedings of the Biological Society of Washington* 93: 1035-1079.
- FUJITA, T. 1928. Further studies on nematodes from fishes of Lake Biwa. *Zoological Magazine, Tokyo Zoological Society* 40: 303-314 (in Japanese).
- GIBSON, D.I. 1983. The systematics of ascaridoid nematodes - a current assessment. pp. 321-338. In Stone, A.R., Platt, H.M. and Khalil, L.F. (eds), 'Systematics Association Special Volume 22. Concepts in Nematode Systematics'. (London. Academic Press).
- GRANT, E. 1987. 'Fishes of Australia'. (E.M. Grant Pty Ltd: Brisbane). 480 pp.
- GUPTA, S.V. AND SRIVASTAVA, A.B. (1984) On some nematode parasites of marine fishes from Puri, Orissa. *Indian Journal of Helminthology* 36: 97-110.
- HARTWICH, G. 1957. Zur Systematik der Nematoden Superfamilie Ascaridoidea. *Zoologische Jahrbücher, Jena (Systematik, Ökologie und Geographie)* 85: 211-252.
1974. Keys to Genera of the Ascaridoidea. pp. i-iv, 1-15. In Anderson, R.C., Chabaud, A.G. and Willmott, S. (eds), 'CIH Keys to the Nematode Parasites of Vertebrates.' No 2. (Commonwealth Agricultural Bureau: Farnham Royal, U.K.).
1975. Schlauchwürmer, Nematelminthes Rund- oder Fadenwürmer, Nematoda parasitische Rundwürmer von Wirbeltieren. I. Rhabdita und Ascaridida. *Die Tierwelt Deutschlands* 62: 1-256.
- HOOPER, J.N.A. 1983. Parasites of estuarine and oceanic flathead fishes (Family Platycephalidae) from northern New South Wales. *Australian Journal of Zoology, Supplement Series* 90: 1-69.
- HSU, G.M. 1957. Studies on nematodes parasitic in birds from Canton, China. *Acta Zoologica Sinica* 9: 47-77.
- HUTCHINS, B. AND SWAINSTON, R. 1986. 'Sea Fishes of Southern Australia.' (Swainston Publishing: Perth). 180pp.
- JOHNSTON, T.H. AND MAWSON, P.M. 1945. Parasitic Nematodes. *British and New Zealand Antarctic Research Expedition 1929-1931. Reports - Series B (Zoology and Botany)* 5(2): 73-159.
1948. Some new records of nematodes from Australian snakes. *Records of the South Australian Museum* 9: 101-106.
- KALYANKAR, S.D. 1970. On a new nematode, *Ahbagascaris pseudosciaenae* gen. et sp. nov. (Ascarididae: Heterocheilidae) from marine fishes of Alibag and Bombay. *Japanese Journal of Parasitology* 19: 549-551.
- KALOOLA, P.J. AND PIERCE, B.E. 1988. A new freshwater catfish (Pisces: Ariidae) from northern Australia. *Records of the Western Australian Museum* 14: 73-89.
- KHALIL, L.F. 1961. On a new nematode, *Raphidascaroides bishaii* sp. nov., from a freshwater fish, *Gymnarchus niloticus*, in the Sudan. *Journal of Helminthology* 35: 263-268.
- KHALIL, L.F. AND OYETAYI, A.S. 1988. *Raphidascaroides africanus* sp. nov. (Nematoda: Anisakidae) from the fish *Bostrychilus africanus* in Nigeria and a key to the species of the genus *Raphidascaroides* Yamaguti, 1914. *Revue de Zoologie Africaine* 102: 85-91.
- KHAN, D. AND YASEEN, T. 1969. Helminth parasites of fishes from East Pakistan. *Bulletin of the Department of Zoology, University of the Punjab (n.s.)* 4: 1-33.
- KOROTAEVA, V.C. AND LEONT'YEVA, V.G. 1972. Helminth fauna of the New Zealand fish *Macruronus novaezelandiae*. *Problemy Parazitologii, Trudy* 1972(1): 403-405.
- KREIS, H.A. (1937) Beiträge zur Kenntnis parasitischer Nematoden. V. Neue parasitische Nematoden aus der Forelle, *Salmo fario*. *Zentralblatt für Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene* 140, Abt 1, Originale: 127-131.
- LÈBRE, C. AND PETTER, A.J. 1983. Deux nouvelles espèces d'ascarides (Nematoda) parasites de poissons téléostéens: *Raphidascaris mediterraneus* n. sp. et *Goezia anguillae* n. sp.; complément de description de *Cucullanus micropapillatus* Tornquist, 1931 (Nematoda, Cucullanidae). *Bulletin du Muséum National d'*

- Histoire Naturelle, Paris* 4th ser., 5, sect. A(2): 491-505.
- MOZGOVOI, A.A. 1950. On the anisakid fauna of fishes and reptiles. *Trudi Gel'mintologicheskoi Laboratorii Akademii Nauk SSSR* 3: 102-118 [in Russian].
1953. Ascaridata of animals and man and the diseases caused by them. *Gel'mintologicheskaya Laboratoriya. Osnovy Nematologii*, Volume 2, (Akademiya Nauk: Moskva). 617 pp.
- OLSEN, L.S. 1952. Some nematodes parasitic in marine fishes. *Publications of the Institute of Marine Science, University of Texas* 2: 173-215.
- PETTER, A.J. 1969. Enquête sur les nématodes de poissons de la région nantaise. Identification des larves d'Ascarides parasitant les sardines (en rapport avec les granulomes eosinophiles observés de l'homme dans la région) *Annales de Parasitologie Humaine et Comparée* 44: 559-580.
- PETTER, A.J. AND CASSONE, J. 1984. Nématodes de poissons du Paraguay; I. Ascaridoidea: *Sprentascaris*, n. gen. *Revue Suisse de Zoologie* 91: 617-634.
- PETTER, A.J. AND MAILLARD, C. 1988. Larves d'Ascarides parasites de poissons en Méditerranée occidentale. *Bulletin du Muséum National d'Histoire Naturelle, Paris* 4th ser., 10, sect. A(2): 347-369.
- PUNT, A. 1941. Recherches sur quelques nématodes parasites de poissons de la Mer du Nord. *Memoirs de Musée Royal d'Histoire Naturelle de Belgique* 98: 1-110.
- RAILLIET, A. AND HENRY, A. 1915. Sur les nématodes du genre *Goezia* Zeder. *Bulletin de la Société de Pathologie Exotique* 8: 270-275.
- RAJYA LAKSHMI, I., HANUMANTHA RAO, K. AND SHYAMASUNDARI, K. 1985. *Raphidascarioides trachinocephalus* n. sp. (Nematoda: Heterocheilidae) from marine fishes at Visakhapatnam. *Indian Journal of Parasitology* 8: 235-238.
- RYE, L.A. AND BAKER, M.R. 1984. *Hysterothylacium analarum* n. sp. (Nematoda: Anisakidae) from pumpkinseed, *Lepomis gibbosus* (Linnaeus), in southern Ontario. *Canadian Journal of Zoology* 62: 2307-2312.
- SANDS, D. 1985. 'Catfishes of the World. Volume 5. Bagridae and others'. (Dunure Enterprises: Ayr, U.K.). 201 pp.
- SANTOS, E. DOS. 1970. Nova espécie do gênero *Raphidascaris* Railliet and Henry, 1915 (Nematoda, Ascaridoidea). *Atas da Sociedade de Biologia do Rio de Janeiro* 14: 39-40.
- SCHMIDT, G.D. AND KUNZ, R.E. 1973. Nematode parasites of Oceanica. XX. *Paraheterotyphlum ophiophagos* n. sp. (Heterocheilidae), from the banded yellow-lip sea snake, *Laticauda colubrina*. *American Midland Naturalist* 89: 481-484.
- SKRJABIN, K.I. 1916. [Contribution to the study of the helminth fauna of Paraguay]. *Zoologicheskii Vestnik* 1(4): 705-757. [In Russian].
- SMITH, J.D. 1984. Taxonomy of *Raphidascaris* spp. (Nematoda, Anisakidae) of fishes, with a redescription of *R. acus* (Bloch, 1772). *Canadian Journal of Zoology* 62: 685-694.
- SOLEIM, O. 1984. A synopsis of the genera *Thynnascaris* and *Contracaecum* (Nematoda, Ascaridoidea) with an emendation of the generic definitions. *Acta Parasitologica Polonica* 29: 85-96.
- SOLEIM, O. AND BERLAND, B. 1981. The morphology of *Thynnascaris udunca* (Rudolphi) (Nematoda: Ascaridoidea). *Zoologica Scripta* 10: 167-182.
- SPAUL, E.A. 1927. A new nematode of the subfamily Anisakinae. *Annals and Magazine of Natural History* (9)19: 627-635.
- SPRENT, J.F.A. 1978a. Ascaridoid nematodes of amphibians and reptiles: *Goezia*. *Journal of Helminthology* 52: 91-98.
- 1978b. Ascaridoid nematodes of amphibia and reptiles: *Paraheterotyphlum*. *Journal of Helminthology* 52: 163-170.
1983. Observations on the systematics of ascaridoid nematodes. pp. 305-319. In 'Systematics Association Special Volume 22. Concepts in Nematode Systematics'. Stone, A.R., Platt, H.M. and Khalil, L.F. (eds), (London: Academic Press).
- SRIVASTAVA, A.B. AND GUPTA, S.P. 1975. On two new species of the genus *Amplicaeum* Baylis, 1920 from marine fishes of Puri, Orissa. *Indian Journal of Helminthology* 27: 119-123.
- THIWAITE, J.W. 1927. On a collection of nematodes from Ceylon. *The Annals of Tropical Medicine and Parasitology* 21: 225-244.
- WARD, H.B. AND MAGATH, T.B. 1917. Notes on some nematodes from freshwater fishes. *The Journal of Parasitology* 3: 57-63, one plate.
- WU, H.W. 1949. A note on two parasitic nematodes of fishes. *Sinensia, Shanghai* 20(1-6): 51-57.
- YAMAGUTI, S. 1935. Studies on the helminth fauna of Japan Part 9. Nematodes of fishes, 1. *Japanese Journal of Zoology* 6: 337-386.
1941. Studies on the helminth fauna of Japan, Part 33. Nematodes of fishes II. *Japanese Journal of Zoology* 9: 343-408.
1954. Parasitic worms mainly from Celebes Part 9.

- Nematodes of fishes. *Acta Medica Okayama* 9: 112-133.
- 1961a. Studies on the helminth fauna of Japan part 57. Nematodes of fishes, III. *Journal of Helminthology*, *R.T. Leiper supplement*: 217-228.
- 1961b. 'Systema Helminthum. Volume III. The nematodes of vertebrates. Part I.' Indian Reprint, 1985. (International Books and Periodicals Supply Service: New Delhi). 679pp.
- YORKE, W. AND MAPLESTONE, P.A. 1926. 'The nematode parasites, vertebrates'. (J. & A. Churchill: London).
- ZEDER, J.G.H. 1800. 'Erster Nachtrag zur Naturgeschichte der Eingeweidewürmer von Johann August Ephraim Goeze.' (Siegfried Lebrecht Crusius: Leipzig). 320pp.